



**Management Review of
Jersey Central Power & Light
Transmission and Distribution
Operation and Maintenance**

JUNE 30, 2003

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1 EXECUTIVE SUMMARY

On August 2, 2002, severe thunderstorms resulted in approximately 180,000 electric customer outages in JCP&L's Central New Jersey (CNJ) region. Following initial reviews by the New Jersey Board of Public Utilities (BPU), the Governor of New Jersey ordered the BPU to further investigate JCP&L's response to the outage.

Following several meetings, JCP&L and the BPU agreed to a stipulation on February 18, 2003. Paragraphs 4 and 8 of this document direct JCP&L to retain an independent consultant "... to undertake a study of staffing levels that would be appropriate for the long term provision of safe, adequate and proper service considering technology and productivity improvements, best practices for maintenance operations, the use of contractors, benchmarking with other utilities, and growth in its service area." This study included "... a review and focused audit of the Company's Planning and Operations and Maintenance programs and practices." JCP&L retained BearingPoint in March 2003 to conduct this study.

1.1 Key Conclusions

1) JCP&L currently has adequate staffing levels to effectively perform T&D operations and maintenance under normal and abnormal conditions for now and in the near future.

- JCP&L has an appropriate resource planning process to address customer growth and load growth through a mixture of training, hiring, productivity improvements and use of technology.

2) FE has implemented a proven and effective approach to improve T&D operations, maintenance, and capital investment at JCP&L under normal and abnormal conditions.

- This approach incorporates leading practices in several areas including outage management, maintenance, and technology. It is also predicated on applying the lessons learned from the 1998 merger of Ohio Edison and Centerior that created FE. This is facilitated by the fact the FE Energy Delivery leadership team has, in large part, remained intact since the 1998 merger.
- Given the proven record of reliability improvement in the FE Ohio regions, it is appropriate for JCP&L to continue to emulate the T&D O&M practices of those regions.
- The reliability improvement goals set for JCP&L are appropriate, and are compatible with those expressed by the BPU.
- JCP&L has allocated adequate FE and JCP&L human and financial resources to expeditiously reach its reliability improvement goals.
- The BPU must continue to verify that targeted reliability improvements are realized, as key indicators will not immediately reflect the results of improvement initiatives.

- FE/JCP&L can improve the efficiency of the approach by relying more on written communication, documentation and implementation of lessons learned.

3) The relationship between JCP&L and its unions is an impediment to implementing necessary changes.

1.2 Summary of Conclusions and Recommendations

This section contains conclusions and recommendations that are the result of this analysis and are further described with supporting information in the body of the report.

Summary of T&D O&M Integration Program

Conclusions

- 1) FE has devised a reasonable approach to effectively integrate FE and JCP&L with respect to T&D O&M.
- 2) FE has appropriately set specific effectiveness and efficiency goals and objectives for the T&D O&M areas at JCP&L.
- 3) The JCP&L reliability goals set by both FE and the BPU are compatible.
- 4) The reliability goals and objectives for the JCP&L T&D O&M areas are appropriately set but they could be consolidated and thereby communicated more effectively.
- 5) FE has an appropriate mix of qualified and experienced FE and JCP&L personnel leading and executing the T&D O&M integration effort.
- 6) The working relationship between FE and the New Jersey unions is poor and is similar to that which existed between FE and the Ohio unions during the early phases of the 1998 merger.
- 7) FE has developed and implemented an adequate practice to plan, validate, implement, and integrate its T&D O&M improvement efforts for JCP&L.
- 8) FE has properly adjusted its merger integration effort to respond to specific T&D O&M conditions unknown at the time the plan was drafted.
- 9) The merger integration program with respect to JCP&L's T&D O&M is generally monitored, controlled and communicated effectively.

Recommendations

- 1) Improve the efficiency of the merger integration program through more systematic identification of the interdependencies and synergies of reliability improvement projects. (Reference Conclusion No. 1)
- 2) JCP&L should provide to the BPU key reliability indicators including CRI, on a basis more frequent than annually, to verify that the expected improvements are being realized. (Reference Conclusions No. 1, 2, and 3)

- 3) Summarize and consolidate reliability performance reports. (Reference Conclusion No. 4)

Governance

Conclusions

- 1) The FE leadership team in Akron has provided the regions, including those of JCP&L, with enough latitude to make decisions locally within corporate guidelines.

Recommendations

None

System Planning and Engineering to Meet Load Growth

Conclusions

- 1) Core Planning, Engineering, and Construction processes are appropriately defined and consistently performed, but not fully documented.
- 2) There are opportunities to strengthen the effectiveness of the JCP&L Project Development process.
- 3) The JCP&L Project Development process is appropriate for anticipating and meeting system load growth.

Recommendations

- 1) Document the JCP&L Project Development process. (Reference Conclusions No. 1 and 2)
- 2) Improve the Project Close Out process by implementing a formal project review process. (Reference Conclusion No. 2)

Maintenance Practices

Conclusions

- 1) JCP&L maintenance practices are generally reasonable and consistent with good utility practice.
- 2) Centralized switching and tagging facilitates outage management network model accuracy and improves safety.
- 3) The Accelerated Work New Business process improves productivity and customer service.

- 4) Measurable improvements in reliability will lag current and planned preventive maintenance initiatives.
- 5) There is insufficient lead-time for projects dictated by the New Jersey Department of Transportation (DOT) schedules.
- 6) JCP&L underutilizes feedback on system conditions from line crews and does not adequately integrate this feedback into maintenance plans.
- 7) FE, and its operating companies, stay abreast of new developments in the Transmission and Distribution Industry.

Recommendations

- 1) Document operations processes / practices. (Reference Conclusion No. 1)
- 2) Continuously improve maintenance practices. (Reference Conclusion No. 1)
- 3) Develop and deploy a formal work prioritization system. (Reference Conclusion No. 1)
- 4) Track maintenance backlog hours and aging of work requests. (Reference Conclusion No. 1)
- 5) Periodically review progress against reliability improvements. (Reference Conclusion No. 4)
- 6) Improve coordination of road construction projects into District schedules. (Reference Conclusion No. 5)
- 7) Record and review, and provide feedback on all employee-identified system problems. (Reference Conclusion No. 6)

Technology

Conclusions

- 1) The recently deployed CREWS/SAP system and processes will improve planning, scheduling, coordination, and reporting of work.
- 2) FE has recently made several technology improvements that will increase outage prediction accuracy, and has processes in place to continually assess and enhance systems and data.

Recommendations

- 1) Develop and deploy a formal work prioritization system. (Reference Conclusion No. 1)

Reliability

Conclusions

- 1) The CAIDI, SAIDI, and SAIFI metrics for CNJ and NNJ have had limited accuracy but the situation is being comprehensively addressed.
- 2) Identifying a trend in any of the reliability metrics for CNJ and NNJ is not possible since only one year of meaningful data is available.
- 3) Regulatory reporting requirements may not allow a meaningful comparison of reliability metrics between New Jersey operating regions (JCP&L – 2 regions, PSE&G – 4 regions, Connectiv – 1 region, Rockland – 1 region).
- 4) CNJ and NNJ have room for improvement to attain reliability similar to other FE Ohio regions.
- 5) The ongoing and planned changes in T&D O&M practices should result in improved reliability metrics in future years.
- 6) Based on a review of both the formulation and the use of the CRI in other FE Regions, it is deemed a sound method for identifying problem circuits upon which to concentrate maintenance and engineering efforts.
- 7) The reason for developing and undertaking the Accelerated Reliability Improvement Plan (ARIP) is sound and we expect it to result in improved reliability.
- 8) The ARIP projects are appropriately linked to the JCP&L reliability improvement program.

Recommendations

- 1) Periodically review progress against reliability improvements. (Reference Conclusions No. 2, 3, 4, 5, and 7)
- 2) Modify reliability reporting requirements to include metrics both with and without storm events. (Reference Conclusion No. 3)

Productivity

Conclusions

- 1) FE is adequately addressing JCP&L bargaining unit sick time usage to better align with other FE operating companies' experience.
- 2) The efficiency per hour worked for CNJ and NNJ Regions can be improved further, and the regions are working toward attaining this goal.
- 3) Overtime usage in the CNJ and NNJ Regions is high compared to other FE Regions.
- 4) Equipment availability is adequate for the levels of staffing and workload for both the CNJ and NNJ Regions.
- 5) Vehicles and equipment in general are well maintained and have no negative impact on work performance.
- 6) Material stock outs for planned work are minimal and do not significantly impact the completion of work.
- 7) The average daily preparation time for district crews is reasonable.
- 8) The 16-hour guideline, a common industry practice, provides a reasonable checkpoint to assess work requirements versus safety.
- 9) Preventive maintenance and emerging corrective maintenance work requests are informally prioritized which may result in lower than desirable priorities.

Recommendations

- 1) Consolidate responsibility for maintenance of transmission equipment. (Reference Conclusion No. 5)
- 2) Include average days overdue for preventative maintenance work in the fleet metrics. (Reference Conclusion No. 5)
- 3) Increase the utilization of Alternative Schedules as provided for in the Agreement and Supplements between JCP&L and Union. (Reference Conclusion No. 7)
- 4) Document operations processes / practices. (Reference Conclusion No. 9)

Work Force Requirements

Conclusions

- 1) The overall staffing of the CNJ Region is more than adequate to meet projected steady state work requirements based on customer base and system mile comparisons.
- 2) The projected December 2004 overall staffing of the CNJ Region assuming retirements of all personnel at least 58 years of age and no inflow of additional personnel is adequate to

meet projected steady state work requirements based on customer base and system mile comparisons.

- 3) The overall staffing of the NNJ Region is more than adequate to meet projected steady state work requirements based on customer base and system mile comparisons.
- 4) The projected December 2004 overall staffing of the NNJ Region assuming retirement of all personnel at least 58 years of age and no inflow of additional personnel is adequate to meet projected steady state work requirements based on customer base and system mile comparisons.
- 5) The use of contractors for vegetation management with regular and comprehensive inspection of work is a reasonable practice.
- 6) The use of contractors for overflow capital project work is a reasonable practice.
- 7) There are job classifications that may see a disproportionate number of personnel retiring in 2004.

Recommendations

- 1) Perform succession planning by job classification. (Reference Conclusion No. 7)

Training

Conclusions

- 1) The Power Systems Institute (PSI) program will provide Overhead Line Workers and Substation Workers in adequate numbers to meet JCP&L's needs.

Recommendations

None

Providing Service Under Abnormal Conditions

Emergency Storm Restoration Plan

Conclusions

- 1) The Emergency Storm Restoration Plan (ESRP) includes many processes that are industry leading practices and is adequate to achieve its stated objective.
- 2) Some sections of the ESRP have not been updated to include JCP&L or the June 2003 SAP / PowerOn implementation, although these impacts would be minor.

- 3) Storm critique sessions are conducted following major outages; however, notes and action items are not consistently maintained, distributed, or monitored.
- 4) Adequate internal communications processes and procedures are in place for use in abnormal operating situations such as major outages.
- 5) Adequate external communication processes and procedures are in place for use in abnormal operating conditions such as major outages, including those for contacting government and regulatory bodies.
- 6) Communications personnel are adequately trained and are able to exhibit skills in operating PowerOn (OMS) so that they have current knowledge of storm and restoration status.
- 7) Work force levels are adequate for the Regional and Corporate communications organizations.

Recommendations

- 1) Update the ESRP to include JCP&L and the June 2003 SAP / PowerOn implementation. (Reference Conclusion No. 2)
- 2) Ensure that storm critique sessions are held following every Level II, III, and IV storm, and that appropriate records of such sessions, including lessons learned, are maintained. (Reference Conclusion No. 3)

Coordination with System Operations

Conclusions

- 1) Procedures are in place and are adequate for system restoration.
- 2) Adequate procedures are in place for requesting and approving line clearances.
- 3) Current staffing levels are adequate.
- 4) Operators can monitor system conditions in real time.
- 5) Coordination with the Regional Dispatch Office (RDO) is satisfactory and initiatives are addressing improvements.
- 6) PJM operations do not adversely affect JCP&L operations.

Recommendations

None

Distribution Dispatch Operations

Conclusions

- 1) The upgraded PowerOn should result in improved outage prediction.
- 2) Operations procedures reflect a proper emphasis on workforce skills and information requirements.
- 3) Appropriate procedures are in place to ensure line clearances and tagging are conducted in accordance with published procedures.
- 4) Training for dispatchers is being evaluated at this time.
- 5) RDO staffing is currently adequate and additional personnel will be required to staff two RDOs.
- 6) Emergency action plans and storm procedures are adequate.

Recommendations

None

Contact Center

Conclusions

- 1) The Reading Contact Center has adequate staffing and technology to answer customer calls within regulatory requirements during an outage.
- 2) Storm support outage procedures for New Jersey are adequate and followed appropriately.
- 3) The Reading Contact Center appropriately participates in drills to help ensure its ability to respond during an outage.
- 4) The Reading Contact Center is appropriately involved in continuing communication with customers during an outage to update them on the storm status.
- 5) Communication protocols to mobilize internal and third party resources during a storm are adequate.
- 6) The Critical Care Customer identification and notification process has been properly implemented.
- 7) The Private Well Water Customer identification and notification process has been properly implemented.

Recommendations

None

Storm Restoration Work Force Requirements

Conclusions

- 1) The current call out response rate for the CNJ and NNJ Regions, although not optimal, is improving.
- 2) The damage assessment process used is a reasonable and systematic approach that allocates resources appropriately.
- 3) Mutual assistance process is good and meets the needs of the CNJ and NNJ Regions.
- 4) The regional crews, in concert with the available mutual assistance support, are sufficient to respond to Level III and Level IV storms.

Recommendations

None

Training

Conclusions

- 1) Training on the ESRP is generally adequate but there is room for improvement.

Recommendations

- 1) Improve training of District line crew personnel on the ESRP and their role in the plan. (Reference Conclusion No. 1)
- 2) Provide District personnel with refresher training on the overall ESRP. (Reference Conclusion No. 1)
- 3) Add Web-Based training for the ESRP. (Reference Conclusion No. 1)

Service Complaints

Conclusions

- 1) On average, JCP&L has had the worst service complaint metrics of the utilities in New Jersey, but ongoing initiatives to improve reliability through CRI, and the ARIP should reduce customer complaints.
- 2) Measures taken by JCP&L, designed to improve reliability, should help to reduce the number of customer complaints.

Recommendations

None

2 INTRODUCTION

2.1 Corporate History

In August 2000, FirstEnergy Corp. (FE) entered into an agreement to merge with GPU, a Pennsylvania corporation headquartered in New Jersey, and a registered public utility holding company, which owned, among other companies, JCP&L, Metropolitan Edison (MetEd) and Pennsylvania Electric Company (Penelec) - three integrated public utility companies, one in New Jersey and two in Pennsylvania. On November 7, 2001, the merger was finalized

FE was created in 1998 from the merger of Ohio Edison and Centerior, which was composed of Cleveland Electric Illuminating Company and Toledo Edison (CEI and TE). As a result of the FE/GPU merger, JCP&L has now become one of FE's seven operating companies, which are:

- Ohio Edison
- Cleveland Electric Illuminating Company
- Toledo Edison Company
- Pennsylvania Power Company
- Pennsylvania Electric Company
- Jersey Central Power & Light Company
- Metropolitan Edison

2.2 Background and Perspective

For several years prior to the merger, JCP&L, as well as other New Jersey utilities, had been scrutinized for issues related to the operation and maintenance of its transmission and distribution system, as illustrated in Figure 1

Outage Start Date	Cause of Outage	Company	# of Customers Affected	BPU Investigation
March 1997 July 1997 August 1997	Snowstorm Severe storm Severe storm	GPU	45,000 93,000 107,000	The BPU accepted 26 recommendations made by Staff, which the company adopted. Many of the recommendations reflected work that GPU already had in progress.
September 1998	Hurricane Floyd	GPU and PSE&G	650,000	The BPU accepted several recommendations of its Staff, which were implemented by the companies. These included recommendations regarding tree trimming, communications, staffing, etc.

Outage Start Date	Cause of Outage	Company	# of Customers Affected	BPU Investigation
July 1999	Heat Wave	JCP&L	100,000	The BPU investigated the failure of two transformers at the Red Bank substation and required JCP&L to assess and report on its T&D O&M practices.
August 2002	Severe Storm	JCP&L	180,000	The Governor ordered the BPU to investigate the matter based on Union allegations that staffing level reductions and the lack of an adequate preventative maintenance program effected the unusually long duration of the outage (seven days). The BPU met several times with FE on determining the appropriate course of action to address the allegations. The different parties came to a resolution of the issues in the form of a Stipulation that was ratified on February 18, 2003. Paragraphs 4 and 8 of the Stipulation require that an independent consultant be retained to review JCP&L's overall ability to provide adequate, safe and reliable power under both normal and abnormal operating conditions.

Figure 1
JCP&L Storm History (Partial)

On August 2, 2002, a major storm event occurred in FE's JCP&L service territory that resulted in approximately 180,000 customer outages the JCP&L Central Region. The facts surrounding this event are well documented in multiple reports to the BPU. The storm caused significant damage to the region including downed trees, utility poles and wires, while rendering many roads inaccessible. Severe thunderstorms with more than 4,000 lightning strikes and high-velocity wind gusts of up to 70 miles per hour hampered the restoration effort. The Monmouth County Emergency Management Coordinator declared a countywide state of emergency at 5:00 p.m. on August 3.

The resulting damage to JCP&L's transmission and distribution systems was extensive as summarized in Figure 2:

Equipment Type Damaged	Count
Poles and cross arms	412
Primary line spans	730
Secondary line spans	434
Fuses and reclosers	1,275
Downed trees in direct proximity of electrical transmission and distribution system	926

Figure 2
August 2, 2002 Storm Damage to JCP&L's T&D System

The restoration effort lasted five days with 66 percent of the affected customers being restored after approximately two days. Additional time and resources were required to restore power to the balance of the customers. Utility crews from other FE operating companies and neighboring utilities were contacted and assisted in the restoration. At the height of the restoration effort, there were approximately 221 FE crews and 84 non-FE crews were actively engaged in restoring the JCP&L system.

Union personnel alleged that staffing level reductions implemented by JCP&L and a lack of an adequate preventative maintenance program contributed to the unusually long duration of the outage.

Union officials reported these allegations to the Governor of New Jersey. The Governor, in turn, ordered the BPU to investigate the matter. The BPU met several times with JCP&L to determine the appropriate course of action to address the allegations. The parties came to a resolution of the issues in the form of a Stipulation that was ratified on February 18, 2003 (Docket No. EX02120950). Paragraphs 4 and 8 of the Stipulation require that an independent consultant be retained to review JCP&L's overall ability to provide adequate, safe and reliable power efficiently and effectively under both normal and abnormal operating conditions. These paragraphs read as follows:

4. JCP&L shall undertake a study of staffing levels that would be appropriate for the long term provision of safe, adequate and proper service considering technology and productivity improvements, best practices for maintenance operations, the use of contractors, benchmarking with other utilities, and growth in its service area. JCP&L shall retain the use of an outside consultant to assist with the study. The consultant shall meet with JCP&L's unions to discuss any concerns they may have concerning such matters, and give considerations to the unions' positions in the study. The consultant shall also meet with Board Staff to discuss any concerns it may have concerning such matters, and to obtain and share information concerning other New Jersey

electric utilities. The study shall be completed and submitted to Board Staff no later than July 1, 2003. This effort shall be coordinated with the work to be undertaken pursuant to Paragraph 8 of the Stipulation.

8. Board Staff shall undertake a review and focused audit of the Company's Planning and Operations and Maintenance programs and practices and, subject to Paragraph 15 of This Stipulation, its compliance with the previous focused audit and Board regulations and applicable statutes. Pursuant to N.J.S.A 48:2.16.4, all expenses associated with the audit shall be borne by JCP&L.

2.3 Project Overview

2.3.1 Objective

The objective of the project, as stipulated by the BPU, is to assess JCP&L's ability to continue to provide adequate, safe and reliable power efficiently and effectively during normal and abnormal (e.g., outage) operating conditions.

2.3.2 Scope

The original scope of this project included reviewing the following JCP&L processes under normal and abnormal (e.g., outage) conditions:

- Transmission and Distribution Operating and Maintenance Core Processes, including:
 - System Planning, Engineering, and Construction
 - System Operations (Regional Dispatching Office and System Control Center)
 - Regional Operations and Maintenance
- Transmission and Distribution Operating and Maintenance Support Processes, including:
 - Supply Chain
 - Fleet / Equipment Management
 - Contact Centers
 - Communications (Internal and External)
- Within these processes, areas of focus included, but were not limited to:
 - Staffing Levels and Composition
 - Contractor Usage
 - Current and Future Technologies
 - Benchmarking and Leading Practices for Transmission and Distribution Operating and Maintenance Activities
 - Project Selection Criteria for Capital and Operating and Maintenance Expenditures

- Drivers of System Extension and Enhancement (including Load Growth)

In addition we realized that we needed to assess the impact of the merger on T&D O&M. This was driven primarily by references to the merger being made continuously in our preliminary interviews with the key stakeholders.

2.3.3 Approach

The project was organized into four phases as depicted in the Figure 3 below.

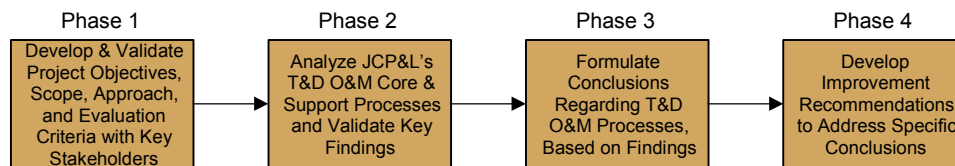


Figure 3

During Phase 1, the BearingPoint project team was mobilized and a group of support personnel from FE was established to provide the BearingPoint project team with timely access to documents and key FE personnel for purposes of conducting interviews. The BearingPoint project team developed evaluation criteria to utilize throughout the project to assess the effectiveness of certain functions, processes and activities. A sampling of the evaluation criteria is provided below:

- Does FE have an appropriate approach to effectively integrate with acquired entities without degradation in T&D O&M service quality, reliability and safety?
- Does JCP&L have clear goals and objectives for improving its T&D O&M processes, practices and procedures from a people, process and technology standpoint?
- What has been the trend in JCP&L's reliability metrics over the last five years? What actions are being taken to improve reliability within its service territory?
- Are staffing levels in the transmission and distribution areas adequate? What are the trends in the staffing levels?

The project objectives, scope, and evaluation criteria were discussed, validated, and finalized with FE management, the BPU and the union leadership. An initial list of document requests and interview candidates was developed during Phase 1.

In Phase 2, BearingPoint conducted over 80 interviews with the following parties:

- FE management personnel at the corporate office in Ohio, regional offices in New Jersey and Pennsylvania
- New Jersey Board of Public Utilities directors and staff
- Union leadership and union line crews
- Personnel from other electric utilities
- Software providers

Additionally, over 90 document requests were fulfilled by the FE support group. Documents were also received from the BPU and the union leadership. These documents totaling over 10,000 pages, in conjunction with information gathered from the interviews, were utilized in performing the assessment of JCP&L's performance against the evaluation criteria. Where appropriate we have used material from these documents, without attribution, to explain or demonstrate our analysis.

Using the validated findings from Phase 2, conclusions were formulated regarding JCP&L's performance during Phase 3 of the project. The preliminary conclusions were developed after the following activities were performed:

- Review of the documents and data received;
- Analysis of all interview notes;
- Comparison of JCP&L's practices to leading industry practices and performance metrics to benchmark data within the electric utility industry.

The preliminary conclusions were then shared with FE management, the BPU and union leadership.

During Phase 4, improvement recommendations were developed to address the findings that did not meet the project teams' expectations. The recommendations took into consideration the following parameters:

- Cost/benefit analysis
- Implementation complexity
- Short and long term operating requirements
- Obligations to customers in JCP&L's service territory
- Previous and current rulings issued by the BPU
- Validated concerns and issues from the unions

The recommendations were formulated in a manner to achieve a balance among these parameters.

3 T&D O&M MERGER INTEGRATION PLANNING AND EXECUTION

3.1 Summary of Integration Program

We reviewed the FE/GPU merger integration program as it applies to JCP&L T&D Operations and Maintenance. The plan consists of several components, including:

- Merger Integration Plan
- Reliability Meetings with the BPU
- CRI Team
- Accelerated Reliability Improvement Plan
- Pairing of JCP&L and FE Employees

3.1.1 Integration Activities

The integration of the former GPU companies into FE, which began in 2000, is proceeding as planned. This effort has not been immune to challenges typically associated with people, processes and systems evolving to a new state. However, the integration process has undoubtedly benefited from the experience gained by FE's management in the 1990s.

FE's primary integration goal was to adopt the better of GPU/JCP&L and FE's practices for T&D O&M. In 2000, a joint FE/GPU team evaluated T&D O&M practices at both GPU/JCP&L and FE and selected those that were more effective and efficient to provide adequate, safe and reliable power to FE's customers, including JCP&L's. Although most of the practices slated for implementation at JCP&L are from FE, there are instances where those of GPU were kept and adopted across all FE regions. For instance, the current JCP&L system planning and enhancement process uses FE's criteria and tools. On the other hand, FE adopted the JCP&L condition-based trigger for substation overhaul instead of the FE schedule-based trigger. The evaluation process culminated in the team creating a merger integration plan in late 2000, containing 36 projects, with 14 of them related to T&D O&M.

We did not find an integrated master schedule used by FE/JCP&L to monitor the status of the projects that comprise the merger integration program. However, through our interviews and review of management reports, we found that interdependencies are effectively addressed through means such as informal monitoring, frequent meetings, and detailed monitoring, corporate process sponsorship, and control of reliability and other metrics. As such, we do not believe that execution of the projects was materially affected by the lack of an integrated master project schedule, but that execution could be more efficient with such a schedule.

During the merger integration period, FE set a goal for JCP&L to become a service provider as safe, reliable, efficient and effective as the FE Ohio regions. As part of the merger integration process, FE conducted an informal survey of JCP&L customers that revealed that they would like to have improvement in their service reliability. FE subsequently set the Circuit Reliability Index (CRI) target at 130 or less for 80% of the JCP&L circuits, which is in line with the goal expressed by the customers. Appendix A provides additional information on the CRI.

The BPU has expressed the goal that JCP&L should be at least an average, not the worst, performer with respect to reliability as compared to the other electric utilities in New Jersey. The BPU reliability goal is consistent with that of FE in that, as JCP&L moves toward becoming as reliable as the FE Ohio regions, it will in the process become as good or better than the other New Jersey utilities. This is of course contingent upon the New Jersey utilities and the FE Ohio regions essentially maintaining their current reliability levels while JCP&L continues to make progress towards improving its reliability levels.

From April 10, 2002, through July 25, 2002, FE held four meetings with BPU Staff to better acquaint them with FE/JCP&L reliability processes and apprise them of ongoing or planned initiatives, as mandated in the FE/GPU Merger Stipulation. The topics covered at these meetings are listed in Figure 4.

April 10, 2002	April 30, 2002
Regional Organization Update Storm Restoration Process Community Connections Update	T&D Technical Services Support Reliability Measurement – CRI Update on OMS
May 28, 2002	June 25, 2002
Forestry Services Progress Report 1999-2002 Capital Expenditures & System Results	Worst Performing Circuits Program OMS-PowerOn Demonstration

Figure 4
Topics of FE/JCP&L/BPU Meetings

To facilitate these discussions, FE had prepared presentation material for the BPU, and additional discussions took place outside of these meetings. At the June 25, 2002 meeting, the BPU did not express any concerns with the approach taken by JCP&L to improve reliability and the progress made so far.

JCP&L has also created CRI Teams in both the Northern New Jersey (NNJ) and Central New Jersey (CNJ) regions, which are comprised of representatives from Engineering, Operations, Forestry, Dispatch, Substation, and Area Managers. These teams meet every two weeks to, among other things, review all outages greater than four hours in duration, formulate high-level alternatives for both short-term improvement needs and long-term system growth and expansion requirements.

FE merger integration methods associated with reliability improvement have been successfully applied in the past. Following the merger of Ohio Edison and Centerior, the Centerior companies

(CEI and TE) realized vast improvements in reliability. The FE team used an approach similar to the one being used for JCP&L to gain better clarity on reliability performance, which culminated with the improvements demonstrated in Figures 5 and 6.

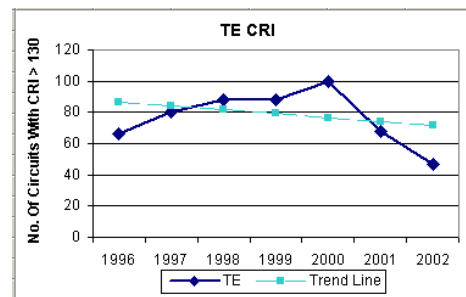
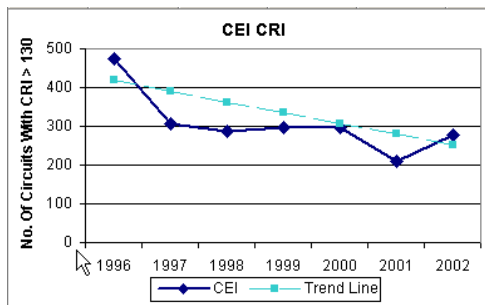


Figure 5
CEI Number of Circuits with CRI>130 1996-2002

Figure 6
TE Number of Circuits with CRI>130 1996-2002

Finally, to further improve reliability, FE management reviewed the status of JCP&L's T&D O&M improvement initiatives that were part of the merger integration effort in February 2003. As a result of that assessment, it was determined that there was a need to increase both the magnitude and the pace of T&D O&M enhancement. The result was the creation of the JCP&L ARIP, which is discussed in further detail in section 4.2.1.1.3.

3.1.2 Workforce

To facilitate the T&D O&M merger integration program, FE and JCP&L retained a mix of FE and JCP&L personnel as indicated in Figure 7. As expected, the 1:1 ratio of pre-merger JCP&L personnel to pre-merger FE personnel indicates that JCP&L's current management is comprised of an adequate number of pre-merger JCP&L personnel. This ratio should reduce the likelihood of organizational

and system knowledge drain at JCP&L, while facilitating JCP&L's transition to the FE way of operating.

Total Post-Merger JCP&L Supervisory- and Managerial-Level Personnel	54
Average Years Professional Experience	24.6
Number of Total Post-Merger JCP&L Supervisory- and Managerial-Level Personnel from Pre-Merger JCP&L	27 of 54
Average Years Professional Experience	24.9
Total Post-Merger JCP&L Supervisory- and Managerial-Level Personnel from Pre-Merger FE	27 of 54
Average Years Professional Experience	23
Ratio of Pre-Merger JCP&L Personnel to Pre-Merger FE Personnel	1:1

Figure 7
JCP&L Management Team Composition

In addition, the fact that FE and JCP&L supervisory- and managerial-level personnel were paired through a "buddy system" during the merger integration program has also helped to ease the merger integration program implementation. The use of a "buddy system" is a recognized leading practice in merger integration.

It has been asserted that FE/JCP&L and the New Jersey unions currently have a rocky relationship. We have seen evidence of this in the form of an increase in the number of disciplinary actions issued by management and a corresponding increase in the number of grievances filed by the union. As part of the merger agreement, FE and System Council U3 agreed to a two-year extension on the union contract and instituted a moratorium on union layoffs. Based on meetings with union leadership, union personnel and FE management, we have made several observations. First, FE views the provisions of the current union contract differently than did GPU. There are different interpretations between the union's and management's understanding of various work rules and policies. Only after repeated attempts to communicate business reasons for changes, to set expectations and to discuss consequences for changes, FE significantly increased the level of discipline associated with work rule/policy violations. One item of particular contention between management and labor is the call-out policy, which is currently in arbitration. In an effort to improve the relationship between labor and management, both parties have agreed to utilize the services of Michael Gaffney, adjunct professor from Cornell University and specialist in labor/management relations.

During the 1998 merger of Ohio Edison and the Centerior companies, the relationship between FE and the Ohio unions was similarly contentious at the beginning, but progressively improved as both parties learned to understand and trust each other. An Ohio UWUA Union President confirmed that the union had a rocky start with FE. Additionally, 485 bargaining unit personnel were laid off in 1998 as the contract had expired, and it took three years to get a new contract. Once the new contract was ratified in 2000, FE worked with the union to negotiate an early retirement plan, thus enabling employees laid off to be recalled to work. Further, in May 2003, the Ohio union and FE successfully

negotiated a successor agreement to a contract that had expired earlier in the year. The current relationship is based on mutual trust as FE and the union have worked together to resolve issues.

3.1.3 Findings and Conclusions

1) FE has devised a reasonable approach to effectively integrate FE and JCP&L with respect to T&D O&M.

- Once the FE/GPU merger was announced in 2000, a joint FE/GPU team evaluated T&D O&M practices at both GPU/JCP&L and FE and selected those that were more effective and efficient to provide adequate, safe and reliable power to FE's customers, including those of JCP&L. Although most of the practices slated for implementation at JCP&L are from FE, there are instances where those of GPU were kept and adopted across all FE regions.
- The evaluation process culminated in the team creating a merger integration plan in late 2000. The plan contains 36 projects with 14 of them related to T&D O&M. Each project has a detailed schedule with tasks and milestones adequately described with an assigned start and end date. The personnel responsible for the completion of the task are also designated.
- Although we did not find an integrated master schedule for all the merger integration projects as part of the plan, we do not believe that execution of the projects was materially affected, as interdependencies were effectively addressed through other means including frequent meetings and more detailed monitoring and control.

2) FE has appropriately set specific effectiveness and efficiency goals and objectives for the T&D O&M areas at JCP&L.

- The merger integration plan contains specific cost savings, cost avoidance and other benefits to be derived from implementing each project. The cost-reduction goals are quantified. The safety and reliability goals are not consistently quantified in the plan. However, FE has set safety and reliability targets and tracks these targets on a regional basis. They are stated in monthly and quarterly reports (e.g. Operation Performance Review Energy Delivery and Customer Service) to the Energy Delivery and Customer Service (EDCS) Senior Vice President.
- The subprojects stemming from the original Merger Integration Plan contain safety and reliability goals and objectives that are quantified. For example, the vegetation control project goal is to achieve a four-year trimming cycle for distribution. However, the expected reliability improvement is not stated.
- Most of the other project goals related to cost savings, new crew composition, and changes to maintenance practices are, however, quantified in terms of dollars, number of

FTEs, and percentages in the matrix. For example, with respect to the operational support function, there is a goal of reducing the scrap rate to 35%.

3) The JCP&L reliability goals set by both FE and the BPU are compatible.

- FE's stated goal is for JCP&L to perform, from a reliability standpoint, as well as if not better than the FE Ohio regions.
- The BPU's expressed goal is that JCP&L should be at least an average, not the worst, performer with respect to reliability as compared to the other electric utilities in New Jersey.
- The BPU reliability goal is consistent with that of FE in that, as JCP&L moves toward becoming as reliable as the FE Ohio regions, it will in the process become as good or better than the other New Jersey utilities.

4) The reliability goals and objectives for the JCP&L T&D O&M areas are appropriately set but they could be consolidated and thereby communicated more effectively.

- The reliability goals for the NNJ and CNJ regions are set iteratively with the regional personnel. The FE senior leadership team proposes reliability goals or standards for the company as a whole. Each region then proposes how they plan to reach or make progress towards the system-wide reliability goal. The FE leadership team then meets with each region's management to discuss and finalize the goals. The reliability targets for each region are adjusted to reflect how much improvement is expected from a particular region over a particular period of time.
- The reliability goals and targets are contained in at least six reports to the FE Energy Delivery Senior Vice President and to region personnel. For instance, FE's ultimate goal is that 80% of system circuits should have a CRI less than 130. This target has been extended to JCP&L and is reflected in the reports that the EDCS SVP receives. In addition, other performance indicators related to safety, budget, and HR are monitored in the same reports. The more widely published Energy Delivery Quarterly Metrics report

does not contain reliability or safety targets as it is primarily used to facilitate benchmarking. The reports referred to include:

Report Name	Description	# Pages	Frequency	EDCS Goals	Targets
EDCS Strategic Measures	Summary of Key Safety, Reliability, Financial Metrics	12 (April 2003)	Monthly	As indicated in Reported Metrics and SAP Performance Index	Yes
Operation Performance Review	Comprehensive report of EDCS metrics and activities.	63 (April 2003)	Quarterly	As indicated in SAP Performance Index and Group Performance Metric Summary	Budget vs. Forecast; ESSS Minimum Customer Service Levels; PUC Reliability Targets; Cumulative Percentage Improvement For Net Congestion Costs Within PJM Over 2002; SAP Performance Index
Customer Service Monthly Metrics	Comprehensive report of Customer Service metrics.	25 (April 2003)	Monthly	No	No
Monthly Letters (17 Reports)	Monthly reports from each region and EDCS functional area	Varies from 1 to 16 (May 2003)	Monthly	No	Inconsistently – Each report is in a different format
Quarterly Metrics Report	Metrics from all areas within EDCS	90 (Q4 2002)	Quarterly	No	CRI; Actual vs. Planned Hours: Substation Build, Line Work Orders, Meter; PUCO Customer Service Standards

Figure 1

- The FE leadership team at all levels has consistently and repeatedly informed us that the JCP&L safety and reliability goals for JCP&L were for the two New Jersey regions to operate at the same performance level as the other FE regions in OH. A region president

stated, for instance, that his personal goal was for his region to be the best performing of the nine FE regions.

5) FE has an appropriate mix of qualified and experienced FE and JCP&L personnel leading and executing the T&D O&M integration effort.

- FE has put in place a proper mix of JCP&L and FE management personnel to facilitate the JCP&L integration process. Based on a review of JCP&L personnel at the manager level or above, we found the ratio of pre-merger JCP&L to pre-merger FE personnel to be 1 to 1. These personnel are properly qualified and experienced to complete the integration and manage JCP&L's T&D O&M.
- Two out of the three highest leadership positions at JCP&L are occupied by pre-merger FE personnel. The president of CNJ occupied the same position at JCP&L prior to the merger, whereas the President and the Vice President of NNJ are from FE.
- In addition, the members of the FE Energy Delivery senior leadership team have extensive experience in the T&D O&M area. They have, for the most part, occupied field, supervisory, and managerial positions within the T&D organization before becoming executives. In addition, they have gained valuable merger integration experience as the majority of them participated in the Ohio Edison and Centerior merger in the 1990's.

6) The working relationship between FE and the New Jersey unions is poor and is similar to that which existed between FE and the Ohio unions during the early phases of the 1998 merger.

- The CEI Ohio UWUA Local 270 Union president stated that the earlier rocky relationship has evolved to one of mutual trust. FE and the Ohio unions have worked together to effectively negotiate a new agreement. In another instance, FE has assisted the union in finding employment for bargaining unit personnel affected by plant closure.
- FE and the New Jersey unions have a similarly rocky relationship, evidenced by a high number of grievances, a strong culture of discipline, and strict interpretation of the union contract. As time goes on, we would expect this relationship to improve as the FE/Ohio union relationship did.

7) FE has developed and implemented an adequate practice to plan, validate, implement, and integrate its T&D O&M improvement efforts for JCP&L.

- FE management and technical personnel meet periodically to review and assess multiple inputs regarding improvement opportunities to JCP&L's T&D O&M. These inputs come from various entities including the BPU, FE, system operational history or analysis, equipment manufacturers, vendors, and industry groups.

- FE has adjusted the integration plan in light of new T&D O&M changing conditions. In 2001, for example, a joint team of JCP&L and FE created the merger implementation plan that selected the better of JCP&L's and FE's T&D O&M practices. In February 2002, a group of FE technical and management personnel met to review the status of JCP&L's reliability improvement efforts. As a result of this meeting, FE launched the JCP&L Accelerated Reliability Improvement Plan.
 - Following the merger of Ohio Edison and Centerior, the Centerior companies (CEI and TE) realized vast improvements in reliability. The approach used by the OE Team to gain better clarity on reliability performance, which resulted in these improvements, is the same approach now being used at JCP&L.
- 8) **FE has properly adjusted its merger integration effort to respond to specific T&D O&M conditions unknown at the time the plan was drafted.**
- FE deconstructed the T&D-related projects in the merger integration plan into multiple subprojects. To the extent that an original project was revised or delayed, FE recorded the reason for the modification as well as the new completion date. For example, the "Construction Standards Manual" originally scheduled to be issued in November 2002 was delayed until March 2003 as documented in the "Merger Integration Plans TDTS Leaders Assignment" document.
 - In February 2003, FE management reviewed the status of JCP&L's T&D O&M improvement initiatives that were part of the merger integration effort. As a result of that assessment, it was determined that there was a need to increase both the magnitude and the pace of T&D O&M enhancement. The result was the creation of the JCP&L ARIP. There are 10 projects linked to reliability to be completed over a two-year period.
- 9) **The merger integration program with respect to JCP&L's T&D O&M is generally monitored, controlled and communicated effectively.**
- As a result of effective monitoring, FE has modified the merger integration plan to reflect delays and changes to the projects that were initially identified.
 - The ARIP that stemmed from the FE management and technical personnel meeting in February 2003 is adequately defined, monitored and controlled. ARIP project personnel meet monthly to review the status of each of the 10 projects. Monthly status reports are produced and appropriately forwarded to FE senior regional management and the executive sponsor. As expected, project personnel including the project manager, meet with FE management periodically to report on ARIP progress.
 - The storm restoration process implementation is the only initiative where FE personnel have expressed differing views regarding the completion date of the implementation effort.

3.1.4 Recommendations for Improvement

- 1) **Improve the efficiency of the merger integration program through more systematic identification of the interdependencies and synergies of reliability improvement projects. (Reference Conclusion No. 1)**

Description: As stated in the report, FE has been effective in implementing the merger integration program with respect to T&D O&M. Although the absence of an integrated project schedule did not impact the ultimate execution of each of the projects, we cannot state that all project or initiative interdependencies were identified. Greater positive synergy among projects is realized when interdependencies are taken into account as duplication of effort can be avoided and resources can be utilized more efficiently.

Cost: The cost is minimal as the resources are already being spent to plan these projects. There will be a cost associated with retraining personnel and institutionalizing the practice.

Benefit: Performing systematic analyses of project interdependencies and synergies will enable FE to execute them more efficiently.

Priority: Medium

- 2) **JCP&L should provide to the BPU key reliability indicators including CRI, on a basis more frequent than annually, to verify that the expected improvements are being realized. (Reference Conclusions No. 1, 2, and 3).**

Description: JCP&L has embarked on several reliability improvement initiatives, including the ARIP. As stated in the report, there is generally a time lag between completing reliability improvement projects and seeing the results reflected in the reliability indicators. We therefore suggest that these indicators be monitored more frequently than annually to verify that progress is made towards ultimately achieving the reliability goals set for the NNJ and CNJ regions.

Cost: We expect the cost to be minimal, as those reliability metrics are already being calculated and collected.

Benefit: This would allow for greater clarity in progress towards the goal and the opportunity to explain and control significant deviation from making progress towards the goals.

Priority: High

- 3) **Summarize and consolidate reliability performance reports. (Reference Conclusion No. 4)**

Description: FE can reduce the number and the size of performance reliability reports that it issues periodically to its personnel.

Cost: Minimal. Personnel will need to spend a few days summarizing and consolidating the six or more reports into one or two.

Benefit: Communication will improve as needed information regarding reliability will now be more focused and available from fewer locations

Priority: Low

3.2 Governance

FE has implemented a decentralized governance model with respect to the nine operating regions. These nine regions resemble the seven operating companies to some extent, as indicated in Figure 8.

Region	Operating Company
OH-Central	Ohio Edison
OH/PA-Eastern	Cleveland Electric / Ohio Edison / Pennsylvania Power
OH-Northern	Cleveland Electric
OH-Southern	Ohio Edison
OH-Western	Ohio Edison / Toledo Edison
PA-Eastern	MetEd
PA-Western	Penelec
NJ-Northern	JCP&L
NJ-Central	JCP&L

Figure 8
FE Regions and Operating Companies

The FE senior leadership in Akron informed us that the operating regions are managed locally, not from the corporate office. The leadership team provides KPI targets, including budget goals, to the regional management, who then make decisions locally to meet their targets. JCP&L management personnel confirmed that this was the practice. For example, industrial relations (IR) employees reporting to corporate used to handle issues related to bargaining unit personnel under the GPU model. Under the decentralized FE model, resolution of such issues is a line personnel responsibility. Corporate IR serves in an advisory capacity to the line personnel with respect to corporate policies and potential consequences of decisions being envisioned.

The goal-setting process is iterative, enabling the regions to discuss the magnitude and timeframe for reaching their targets. The FE senior leadership team proposes reliability goals or standards for the company as a whole. Each region then presents how they plan to reach or make progress towards reaching each system-wide reliability goal. The FE senior leadership team then meets with each region's management to discuss and finalize that region's goals. The reliability targets for each region

are adjusted to reflect how much improvement is expected from a particular region over a particular period of time.

3.2.1 Findings and Conclusions

- 1) **The FE leadership team in Akron has provided the regions, including those of JCP&L, with enough latitude to make decisions locally within corporate guidelines.**
 - FE has put in place a decentralized structure, which gives the regions latitude to make decisions locally. FE set KPI targets, budget and policy guidelines. The regions are tasked with reaching agreed upon targets within corporate guidelines and approved budgets. We have found no instances of corporate making decisions for the regions outside of the practice described above.

3.2.2 Recommendations for Improvement

We have no recommendations regarding this section.

4 JCP&L CAPABILITY TO PROVIDE RELIABLE SERVICE

4.1 System Planning and Engineering to Meet Load Growth

4.1.1 Background and Current Situation

The scope of our review in the area of load growth included the System Planning and Engineering functions in general and the following five processes that relate to capital and O&M project development and execution in particular:

Project Identification: Encompasses those activities associated with assessing project feasibility; ensuring that prospective projects are in alignment with corporate strategy and the current business environment; and ascertaining the economic and technological benefits that result from the project.

Project Selection: Encompasses those activities associated with analyzing the quantitative and qualitative benefits of the project; developing and analyzing alternatives; determining and analyzing project risks; developing financial models; selecting the best alternative; and obtaining authorization to proceed.

Project Design: Encompasses those activities associated with performing detailed design work and developing a detailed project plan.

Project Execution: Encompasses those activities associated with project scope, schedule, and budget management; project performance monitoring; and quality control/quality assurance.

Project Close Out: Encompasses those activities associated with project acceptance and technical/administrative project closure.

As Figure 9 illustrates, these processes comprise JCP&L's overall Project Development process and serve as a framework for evaluating project alternatives; making consistent financial decisions; authorizing projects; obtaining funding for approved projects; providing for technical and administrative oversight during execution; and expediting project closure.

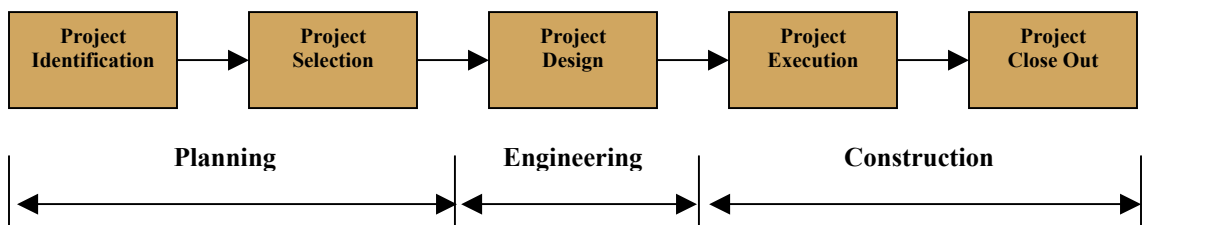


Figure 9
JCP&L Core Planning, Engineering, and Construction Processes

Following the GPU merger, FE has provided both JCP&L regions with autonomy to develop sub-transmission and distribution projects as they choose; as such, overall responsibility for the management of the Planning, Engineering, and Construction functions and underlying processes lies at the regional level.

Our scope also included a review of recent capital expenditure trends.

4.1.1.1 Project Identification

JCP&L has a process in place to identify potential capital and O&M projects. A Circuit Reliability Index (CRI) Team, which is comprised of representatives from Engineering, Operations, Forestry, Dispatch, Substation, and Area Managers, meets every two weeks to review reliability metrics and review outages with duration greater than 4 hours. During the course of these meetings, the CRI Team generates conceptual projects and formulates high-level alternatives in response to both short-term improvement needs and long-term system growth and expansion requirements. The interdisciplinary composition of the CRI Team contributes toward aligning projects with corporate strategy and current business conditions.

In addition to system reliability, JCP&L considers such factors as summer loads and new customer hookup information to identify potential projects. The methods that JCP&L currently employs to collect and utilize load growth and system reliability data with respect to identifying potential projects are satisfactory.

Regarding longer-term needs, JCP&L utilizes a yearly Distribution System Assessment that contains load growth information from all nine operating regions and provides a basis for analyzing system load growth and planning enhancement projects. The Distribution System Assessment was initially conducted in 2001 and was repeated in 2002 to include the former GPU companies.

4.1.1.2 Project Selection

JCP&L personnel involved in the project selection process reference FE's local transmission and distribution Planning Criteria to ensure the orderly and economic expansion of the JCP&L transmission and distribution system. FE initially rolled out its local transmission and distribution Planning Criteria to both JCP&L regions in 2001. The Planning Criteria are consistent with those utilized by comparable electric utility companies and include the following:

- Load Forecasts
- Standard Voltage Levels
- Transformer Ratings
- Local Transmission System Testing Analysis
- Maintenance Outages
- Distribution System Testing Requirements

- System Voltage Requirements
- Reliability Testing
- Miscellaneous Criteria, which include Power Factor Correction, Underground Cable Ratings, Voltage Regulator Ratings, and Short Circuit Ratings

For projects in excess of \$50,000, a business case preparation and review process involving various levels of senior management has been put in place to determine the viability of proceeding with the project. The business case defines the need for the project and the tangible and intangible benefits that would result from executing the project. It also presents a high level scope, schedule, and budget; provides detailed financial analyses and forecasts; and identifies risks that may occur at various points of the project life cycle. In addition to the Planning Criteria, a variety of economic, technical, and sensitivity factors are routinely considered in the business case. These factors may include, but are not limited to:

- Project Goals and Objectives
- Number of Customers Impacted
- Risk Probability and Impact
- Circuit Characteristics
- High Visibility / High Criticality Areas (e.g., hospitals, police, fire)
- Customer Class (residential, commercial, industrial)
- Estimated Project Cost
- Estimated Cost of Alternative Solutions Considered
- Reliability Impact
- System Growth Requirements
- Intangible Project Benefits

Both JCP&L regions follow a consistent approach to evaluate, rank, and select capital and O&M projects by making use of FE's proprietary Capital Analysis and Risk Tool (CART) software tool. CART was deployed throughout FE during late 2001 to provide a consistent framework to increase capital and expense evaluation effectiveness and to support decisions to accept or reject alternative projects. CART integrates risk volatility in the evaluation of project options and calculates project benefits in line with FE's corporate strategy. All projects in excess of \$50,000 are subject to CART analysis.

CART provides a mechanism to evaluate investment opportunities through risk analysis and its primary outputs are probability distributions for alternative economic outcomes. Accordingly, the decision to select or reject a project is predicated on quantitative analysis. All other factors being equal, projects with lower coefficients of variation will tend to be selected as they have less risk per unit of return. Riskier projects will tend to be deferred or rejected.

The decision to accept or reject projects lies at the regional level. As such, a prospective JCP&L project does not “compete” with prospective projects in other FE regions during the selection process, although the number of projects that JCP&L can undertake in any fiscal year is capped by available budget dollars for that fiscal year.

JCP&L personnel currently follow a formal procedure to prioritize, authorize, budget, and control capital and O&M project expenditures. The Levels of Signature Authority Policy (LOSA) documents the processes, procedures, and protocols that are to be followed by JCP&L personnel involved in this process.

Approval authority levels have been established to put appropriate internal controls in place with respect to authorizing and approving funding for a project.

4.1.1.3 Project Design

Throughout the project design process, engineers and designers refer to the T&D Construction Manual that contains standard designs. The T&D Construction Manual is regularly updated to include new design standards or approved revisions to existing design standards. Interviews with JCP&L engineering personnel revealed that their routine use of T&D design standards results in greater efficiencies and clearly leverages corporate design and construction experience.

Plans, specifications, and estimates are prepared at a level of detail that clearly defines the work to be performed, thereby minimizing scope changes and cost overruns. Current change-order processes are reasonable and do not interfere with project execution.

Virtually all design work is performed in house by JCP&L or FE corporate employees. In the rare event that an engineering consultant is required, JCP&L would retain that firm for extraordinary, non-routine project work (e.g., URD design). When consulting engineering services are deemed necessary, JCP&L has a process in place to solicit bids and make a selection. There are no evident quality or performance issues associated with the use of engineering consultants.

Interviews with JCP&L engineering managers revealed that cost and schedule estimates are generally accurate. Operations personnel frequently work with the engineering staff during the estimating process to help develop reliable estimates.

4.1.1.4 Project Execution

A repeatable process is in place to monitor project status, to identify cost and time variances, and to propose budget and schedule recovery measures for under-performing projects. This process involves directors and managers from the Operations, Engineering, and Administrative functions and takes

place during monthly planning meetings. The ARIP projects are examples of closely monitored projects or programs.

Operations Managers are responsible for managing project budgets, with the Director of Operations having overall responsibility. Progress against budget is measured on a regional level on a monthly and year-to-date basis. Project-level financial data can be obtained from the SAP system for review and analysis. The data obtained is at an appropriate level for analysis and decision making.

No major quality or performance issues with contractors were evident. JCP&L personnel regularly monitor contractor work and perform quality inspections.

4.1.1.5 Project Close Out

A repeatable process is in place to facilitate the administrative closure of capital and O&M projects. Responsibility for initiating project close out lies at the district level and no technical or administrative barriers related to closing out projects are apparent.

Based on our interviews with JCP&L personnel, the lag time from the point at which a constructed asset is placed into service to the point at which fixed asset accounting entries are made is minimal.

With respect to technical project closure, JCP&L relies upon an informal feedback loop to ascertain that project acceptance criteria have been met; to verify end user satisfaction; and to discuss “lessons learned” with respect to improving the project identification, selection, design, execution, and close out processes. This informal feedback loop tends to focus on those projects that were over budget and/or behind schedule.

4.1.1.6 Capital Expenditure Trends

Regarding recent capital expenditure trends, we noted an increase in FY 2001 capital expenditures from FY 2000 levels followed by a decrease in FY 2002. However, the influx of capital spending during FY 2001 is not expected to result in an immediate improvement in reliability, therefore no conclusions can be drawn from the results of this analysis.

Following the merger, all capital expenditures and projects were reviewed to determine why it was commissioned, how it compares to the new planning criteria, if it still makes sense to complete the project, and if there was an alternative solution. As a result of this review a number of projects were removed from JCP&L’s 2002 capital plan.

The three primary reasons projects were abandoned are:

- Projects related to bringing in 69Kv transmission lines to NJ, because the company could not get the appropriate permits
- Application of ANSI C5791 standards regarding the overload of substation equipment, which had not previously been applied at GPU.

- Application of House-Tuttle equation that accounts for the cooling effect of wind, which had not previously been done at GPU.

See Figure 10 for capital expenditures for the last three years. The lower CAPEX in 2002 resulted from this review.

Region	2000	2001	2002
NJ-Central	\$70.9 million	\$72.4 million	\$56.7 million
NJ-Northern	\$59.4 million	\$79.4 million	\$37.5 million

Figure 10
Actual Capital Spending

4.1.2 Findings and Conclusions

- 1) Core Planning, Engineering, and Construction processes are appropriately defined and consistently performed, but not fully documented.**
 - Executives and managers who are responsible for the Planning, Engineering, and Construction functions have a common understanding of the Project Identification, Project Selection, Project Design, Project Execution, and Project Close Out processes and possess the knowledge and skills to fulfill their roles and responsibilities.
 - Our review of current staffing revealed that engineering staffing levels are, based upon our experience, consistent with those in place at comparable electric utilities.
 - To facilitate compliance with general corporate guidelines, FE has rolled out various protocols and tools to both JCP&L regions to consistently plan projects (FE T&D Planning Criteria); to initiate projects (Project Initiation Request); to evaluate capital and O&M investment opportunities through quantitative project risk analysis (CART); to approve projects (Request For Project Approval); and to prioritize, authorize, budget, and control project expenditures (LOSA).
 - Key activities that comprise the five Planning, Engineering, and Construction processes seem to be stable and repeatable but are not fully documented.

2) There are opportunities to strengthen the effectiveness of the JCP&L Project Development process.

- Although FE has provided personnel in both JCP&L regions with protocols, tools, and training related to project planning, engineering, and construction, comprehensive, end-to-end Project Development process documentation is lacking. Process capability is largely based on a common organizational understanding of activities, roles and responsibilities, which may introduce some variations in process performance – particularly in light of the autonomy that both JCP&L regions have been granted with respect to developing sub-transmission and distribution projects. Other than routine project cost and schedule analysis, there are no apparent mechanisms in place to measure the effectiveness of the Project Development process.
- Regarding the Project Close Out process, administrative project closure activities and protocols are well defined. However, the activities related to technical project closure – for example, evaluating project results and lessons learned for use in planning and executing future projects – are comparatively informal and performed less frequently. As such, the opportunity to utilize project performance feedback in continuously improving JCP&L’s project planning, selection, design, and execution processes is limited.

3) The JCP&L Project Development process is appropriate for anticipating and meeting system load growth.

- The Project Identification, Project Selection, and Project Execution components of the Project Development process provide JCP&L with an appropriate framework to plan, select, and construct system load growth-related projects.
- FirstEnergy prepares an annual Distribution System Assessment (DSA) that contains information from all operating regions on load growth. The DSA is comprehensive and provides a solid basis for system load growth analysis and enhancement project planning.
- Planners routinely detail short-term JCP&L anticipated load growth to city and subdivision levels as part of the Project Development process.

4.1.3 Recommendations for Improvement

1) Document the JCP&L Project Development process. (Reference Conclusions No. 1 and 2)

Description: Document the entire Project Development process, including organizational and functional roles, responsibilities, and accountabilities; key activities.

Cost: It may require a substantial amount of work to create this documentation.

Benefit: Supplementing the protocols and tools that JCP&L personnel currently use for developing projects with comprehensive, end-to-end Project Development process documentation would contribute toward predictable and consistent process performance while allowing each region to retain the autonomy to develop the projects that are deemed necessary. Organizational and functional roles, responsibilities, and accountabilities would be clearly delineated; key activities would be appropriately defined; and the ability to control process performance would be maximized, as would the ability to measure process performance and identify process improvement opportunities.

Priority: Low

2) Improve the Project Close Out process by implementing a formal project review process. (Reference Conclusion No. 2)

Description: The informal project review process that is currently in place should be replaced with a formal project review process for all projects that are valued in excess of an established threshold (perhaps in excess of the \$50,000 threshold that triggers the existing JCP&L Project Initiation Request protocol). This formal review process would address every project in excess of the established threshold regardless of its success or failure.

Cost: The cost of conducting the meetings and addressing lessons learned should be relatively low.

Benefit: A formal project review process would provide assurance that project acceptance criteria were met; that project results were reviewed; and that a list of lessons learned from the project were developed and documented. Most importantly, this process would provide a formal feedback mechanism from the project team to others involved in the project development process – from those who were involved in planning the project to those involved in handling administrative closure.

Priority: Medium

4.2 Capability to Provide Service Under Normal Conditions

Six areas were examined as part of the assessment of the CNJ and NNJ Regions' capability to provide service under normal conditions. Each of these areas is described in a subsection.

- Maintenance Practices
- Technology
- Reliability
- Productivity – concentrating on line personnel
- Work Force Requirements – concentrating on line personnel
- Training – concentrating on line personnel

4.2.1 Maintenance Practices

4.2.1.1 Background and Current Situation

Maintenance practices in the CNJ and NNJ Regions can be viewed in three timeframes:

- JCP&L with operations responsibility in New Jersey
- GPU Energy management of MetEd, JCP&L, and PennElec consolidated.
- Post FE merger with operations responsibility in the CNJ and NNJ Regions

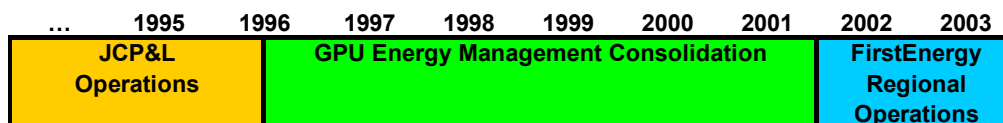


Figure 11
JCP&L Timeline

Personnel who worked in the CNJ or NNJ Regions during all three timeframes consistently described the same periods. Many of the maintenance programs and methods FE is now following in the CNJ and NNJ Regions were previously in place during the JCP&L Operations period. During the period from 1996 to approximately 2000, many supervisory positions were eliminated and field visits by the remaining supervisors were considered unnecessary.

Following are some examples of Leading Practices currently followed by JCP&L:

- New Business work is prioritized and expedited
- Planning includes materials, equipment, personnel, permits, etc.

- Daily meetings to review safety and upcoming work
- Work history is documented, including emergency work.
- Tracking of Planned hours vs. Actual hours and schedule compliance
- Preventive Maintenance Program for Substations is used
- Preventive Maintenance Program compliance is tracked
- Equipment and work histories are utilized for maintenance and engineering improvement
- Preventive Maintenance Program is adjusted based on history and new developments
- Root causes of problems are identified
- Regular analysis and reporting of statistics to management team for determining any corrective actions required
- Continuous improvement in system data

Improvement in maintenance practices would result from incorporating additional Leading Practices, such as:

- Documenting all operations and maintenance processes/practices to ensure consistency across FE.
 - For example, for infrequently used test equipment that requires specific set-up and use. To ensure proper results, documentation of the processes would supplement training and more likely produce consistent results from tests.
- Formal ongoing review of processes/procedures to identify opportunities for improvement.
- All work is formally prioritized based on criticality: Preventive Maintenance, Corrective Maintenance (proactive prior to failure), New Business, etc.
- Rapid follow-up of corrective maintenance (prior to failure). No longer than a month depending on criticality.
- Monitor work backlog by work type such as new business, preventive maintenance, corrective maintenance including aging. JCP&L performs some monitoring.

4.2.1.1.1 Inspection/Preventive Maintenance

JCP&L has reviewed its Inspection/Maintenance programs and as a result has implemented a number of improvements or new programs. Some of these programs are discussed below.

4.2.1.1.1.1 Vegetation Management

The current vegetation management program is regionally managed with clear accountability for execution. Distribution and transmission facilities are on a 4-year cycle with professional foresters assessing requirements and inspecting all completed work. In addition, random audits are conducted to verify contractor compliance to standards.

The first 4-year trimming cycle will be completed in a compressed 3-year cycle by the end of 2004 through the Accelerated Vegetation Management Project under the ARIP. As the first cycle progresses, both the CNJ and NNJ Regions should see a noticeable and sustained reduction in vegetation related outages.

Interviews with NNJ Region crew supervisors indicated a significant reduction in current call-out frequency related to vegetation issues compared to historical call-out frequencies.

4.2.1.1.1.2 Work Prioritization and Assignment

FE has introduced a rigorous planning and scheduling process. Work is appropriately prioritized and assigned. Each Region has a Master Schedule that contains all the major projects planned for the calendar year.

Each District is responsible for maintaining a two-week rolling schedule of all work to be performed in the District. The first week's schedule is considered fixed while the second week is subject to change based on emerging work. Crews are assigned work each morning based on the schedule.

4.2.1.1.1.3 New Business Work Process

As work arises, it is divided into three streams: Accelerated, Planning, and Engineering. Accelerated Work is an FE New Business process that eliminates unnecessary steps and approvals in assigning work. Work in the Planning stream requires some coordination and design prior to scheduling. Work in the Engineering stream requires more engineering and planning prior to scheduling. The Accelerated Work:

- Does not require engineering, design, or planning as standards for such activities are applied.
- Can be directly assigned to the crew schedule by the planner/scheduler.
- Does not require a field visit prior to performing the job.
- Is completed using stock material.

The elimination of the unnecessary handoffs improves the turnaround time and allows engineering and design personnel to concentrate on value added work. The accelerated workflow is diagramed in Figure 12. The portion of the accelerated workflow shown in Figure 12 that is new to CNJ and NNJ is the line work. Meter work was previously done in an accelerated fashion by JCP&L.

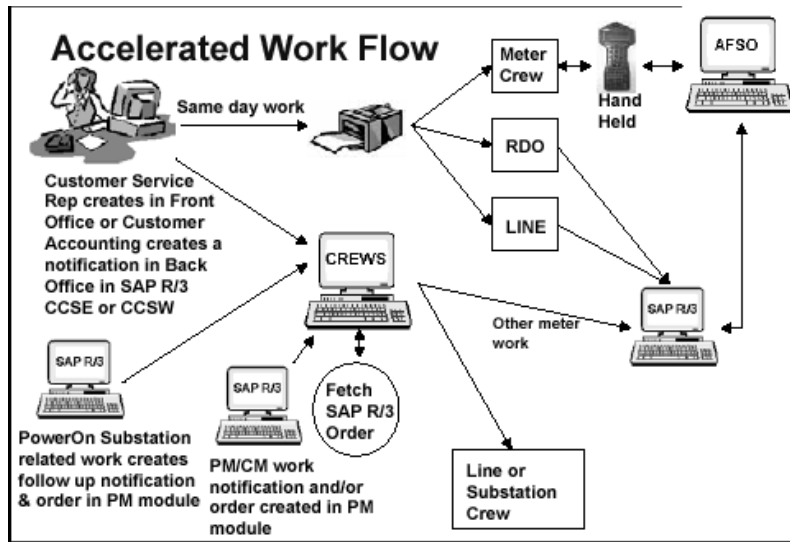


Figure 12
FE Accelerated Work Flow Process

4.2.1.1.4 Centralized Switching and Tagging

Prior to the merger, field switching and tagging was handled, as required, by crews for the work being performed. There was no centralized clearing of the changes to the system or to ensure the restoration conformed to the system model. This method of field switching and tagging contributed to the discrepancies in the system maps as compared to the actual physical system.

The Regional Dispatching Office (RDO) manager stated that in the past there were instances where someone shifted load that was not known to the RDO resulting in burning down wire.

The new switching and tagging process is centralized with the RDO as the focal point. Centralized switching and tagging is safer for line personnel and enables the physical system configuration and the recorded system configuration to be congruent.

Some line crew personnel view the centralized switching and tagging as a step backward because it may take more time. However, when done properly, centralized switching and tagging is a safer method of operating and well worth the additional time invested. An additional benefit is the maintenance of the system configuration in real time as the physical switching is done. The RDO always knows the physical configuration of the system at that point in time. This enables improved prediction accuracy and improved efficiency.

4.2.1.2 Findings and Conclusions

- 1) JCP&L maintenance practices are generally reasonable and consistent with good utility practice.

- JCP&L has introduced a rigorous planning and scheduling process enabling a better utilization of personnel, equipment and materials by concentrating on the highest priority work. In this process, most work is prioritized based upon the criticality of completion and then assigned to work crews based upon these established priorities. Each Region maintains a Master Schedule of work for a complete calendar year that contains all the major projects planned for the year and each District maintains a two-week schedule of all work to be completed in the District. By establishing priorities and then executing work in order of priority JCP&L will apply the available resources to the most important work.
- JCP&L has established Regional CRI Teams, which contribute to establishing priorities for maintenance and system improvements. This group, composed of representatives of Engineering, Operations, Operations Support, Substations, RDO and Area Managers, meets regularly to reduce CRI by recommending engineering, maintenance and process solutions to improve reliability.
- However, this is an informal method of prioritization and does not address “correction before failure” maintenance activities. In many instances, this type of work is not assigned a priority based on the above method.
- The vegetation control program uses professional foresters to assess requirements and inspect all completed work. In addition to the 100% joint quality control inspections conducted by the JCP&L forester and the trimming contractors, JCP&L conducts random audits to verify contractor compliance with JCP&L standards. To expedite the improvements to reliability that will result from better vegetation management, JCP&L has compressed the normal 4-year trimming cycle into a 3-year cycle with completion expected by the end of 2004.
- The following leading practices are not followed by JCP&L:
 - Documenting all operations and maintenance processes/practices to ensure consistency across FE.
 - Formal ongoing review of processes/procedures to identify opportunities for improvement.
 - All work being formally prioritized based on criticality: Preventive Maintenance, Corrective Maintenance (proactive prior to failure), New Business, etc.
 - Rapid follow-up of corrective maintenance (prior to failure). No longer than a month depending on criticality.
 - Monitoring work backlog by work type such as new business, preventive maintenance, corrective maintenance including aging. JCP&L performs some monitoring.

2) Centralized switching and tagging facilitates outage management network model accuracy and improves safety.

- The centralized switching and tagging procedure will allow JCP&L to maintain the electronic system model and physical configuration in synchronization. This contributes to better prediction of the number of customers out of service and improves safety for the field work force.
- Maintaining synchronization of the model and physical systems leverages the technological capabilities of the GIS and OMS and will return greater benefits.
- The improved predictive capability in the RDO allows better utilization of assets to meet customer loads and improves daily operations.

3) The Accelerated Work New Business process improves productivity and customer service.

- The process adopted at JCP&L eliminates unnecessary steps and approvals in assigning work.
- The elimination of the unnecessary handoffs to engineering, design or planning allows engineering and design personnel to concentrate on value added work.
- The accelerated completion time improves customer satisfaction.

4) Measurable improvements in reliability will lag current and planned preventive maintenance initiatives.

- The noticeable impact of revised and improved Preventive Maintenance programs will lag implementation by several years because such programs require some time to complete a cycle.
- As part of the merger, preventive maintenance program periodicities were reviewed and in many cases extended from GPU practices. Those extended were based on FE experience with like equipment. In many cases a periodicity was established where GPU had none. The net result will be common maintenance periodicities and standards across FE.

5) There is insufficient lead-time for projects dictated by the New Jersey Department of Transportation (DOT) schedules.

- It was asserted in multiple interviews that many DOT road-widening projects are dropped into the district work planning process with minimal advance notice.
- As the district work schedule is prepared on an annual basis, these DOT projects resulted in significant scheduling changes and conflicts for the available resources of line crews.
- Additionally, sufficient lead-time is not available to Planners to level resources, resulting in inefficiencies in JCP&L's work schedules.

6) JCP&L underutilizes feedback on system conditions from line crews and does not adequately integrate this feedback into maintenance plans.

- Bargaining Unit employees raised a number of examples regarding specific problems with the system condition.
- There does not appear to be a clear process to collect these observations and integrate them into the maintenance plans for evaluation and correction based on the reviews performed.
- Employees are not generally provided feedback on actions taken in response to observations reported.
- Though all employees have been directed to contact the regional leadership directly if they believe their observations on system conditions are not being addressed, we do not believe this is a workable solution given the current relationship between the bargaining unit and management.

7) FE, and its operating companies, stay abreast of new developments in the Transmission and Distribution Industry.

- FE participates widely in industry associations and committees.
- FE has a group of individuals at the corporate level that stays abreast of new technologies in the T&D O&M space. The group's goal is to identify new technologies that can enhance the performance of the FE system from reliability, cost, and safety perspectives.
- FE is continually investigating improved practices and does not have a "not invented here attitude" (e.g. CRI based on HL&P Practice, Emergency Storm Restoration Process based on Florida Power and Light process, and many of GPU's substation maintenance practices were adopted corporate-wide by FE.)

4.2.1.3 Recommendations for Improvement

1) Document operations processes / practices. (Reference Conclusion No. 1)

Description: Document all operations processes / practices in revision-controlled documents.

Cost: The cost is dependent upon the scope. The first step of the process should be an assessment to determine the scope of work required.

Benefit: Captures and propagates practices in a controlled manner. Developing formal procedures for common processes and practices can accelerate the rate of the experience learning curve for line and substation crews. It takes considerably longer to acclimate to work practices if the transfer of knowledge is dependent on oral communication and demonstration. Also, the consistency of the practices deteriorates with the passing of time and the greater number of people passing along the information.

Priority: High

2) Continuously improve maintenance practices. (Reference Conclusion No. 1)

Description: Continuously review and map variations in maintenance practices in the FE Regions/Districts to identify possible best practices to be adopted by all regions/districts. Determine if differences due to environment, work practices, etc.

Cost: Most of the costs involved would stem from reviewing and updating the practices and are anticipated to be minimal.

Benefit: Continuous improvement of documented practices / processes.

Priority: High

3) Develop and deploy a formal work prioritization system. (Reference Conclusion No. 1)

Description: Develop and deploy a formal comprehensive work prioritization system for line work that includes preventative and corrective maintenance, as well as New Business work. Utilize the priority field in CREWS.

Benefit: All work is prioritized based on consistent criteria, allowing for optimal resource allocation.

Cost: Develop, document, train, and deploy the methodology.

Priority: Medium

4) Track maintenance backlog hours and aging of work requests. (Reference Conclusion No. 1)

Description: Modify current metrics reports to include tracking of maintenance backlog hours and aging of work requests by work type, region, and district.

Cost: Minimal. Determine method of collection and presentation, then include in existing reports.

Benefit: Allows objective decisions on the best deployment of resources, and will be helpful in identifying bottlenecks, improved practices, etc.

Priority: High

5) Periodically review progress against reliability improvements. (Reference Conclusion No. 4)

Description: Periodically review reliability improvements against a baseline reference.

Cost: No incremental cost, as reliability is currently reviewed monthly by the CNJ and NNJ Regions and annually by the BPU.

Benefit: More reliable analysis of progress, as 2002 data is much more dependable data than that from previous years.

Priority: Medium

6) Improve coordination of road construction projects into District schedules. (Reference Conclusion No. 5)

Description: Improve coordination of the process with state and local governments regarding the utility relocations associated with road construction projects.

Cost: Review process to document and identify bottlenecks and redesign.

Benefit: Improved scheduling, leading to improved customer satisfaction and efficiency in resource scheduling.

Priority: High

7) Record and review, and provide feedback on all employee-identified system problems. (Reference Conclusion No. 6)

Description: Record all employee-identified system problems as Work Requests, then review each in the system before canceling or approving them.

Cost: Time to record and review the Work Requests.

Benefit: A better-maintained system utilizing the observations of an experienced workforce who spend a large amount of time in the field. Also, recording and reviewing each employee-identified problem will likely demonstrate to employees that the company trusts and values their input.

Priority: High

4.2.2 Technology

4.2.2.1 Background and Current Situation

In June 2003, the CNJ and NNJ Regions moved to a SAP/CREWS system for work management as part of an FE-wide system upgrade. CREWS (Customer Request Work Scheduling System) is a work management system customized to FE's specifications to provide functionality specifically to the transmission and distribution environment.

Figure 13 provides an overview of the interactions of the work management process modules.

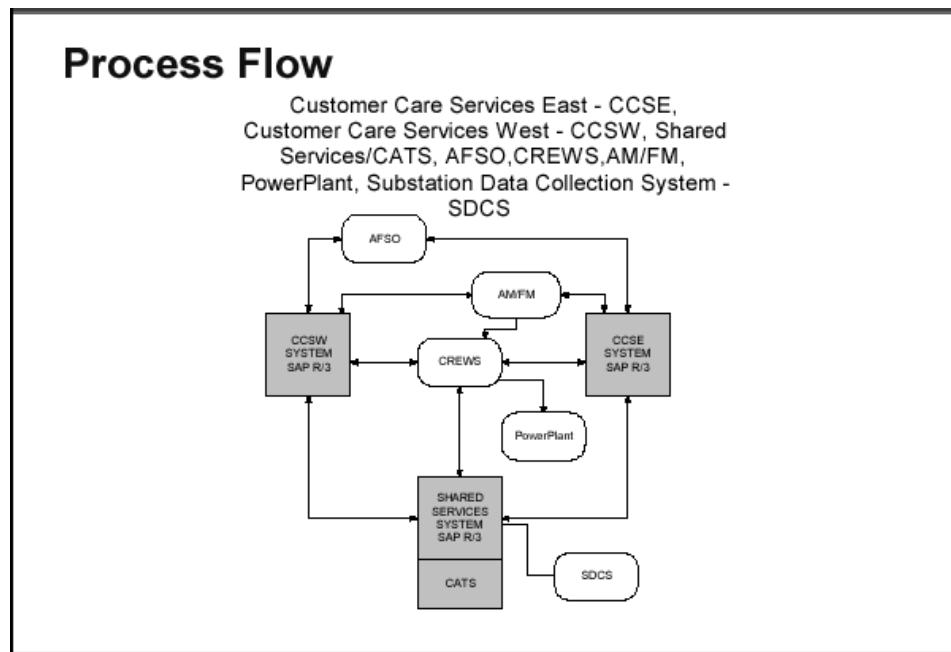


Figure 13
Work Management Process Flow

The Work Management Process Components are described below.

- CREWS: Customer Request Work Scheduling System (CREWS) provides the functionality for estimating job costs and man-hours, scheduling, routing, billing, joint

use, time reporting, construction/work completion, managing job tasks and reporting on jobs. Notifications created in SAP create CREWS work requests. Within CREWS, personnel, equipment and material requirements are added based on the job type to route and track jobs. When the work request is closed, CREWS automatically sends asset information to PowerPlant (PP) for jobs designed in CREWS.

- AFSO: Automated Field Service Order (AFSO) is a mainframe program used to facilitate meter installation, maintenance, and removal. This program communicates with SAP R/3 and automatically uploads and downloads information to and from handheld units to facilitate meter work and completion.
- AM/FM: Automated Mapping and Facilities Management (AM/FM) is a program used to design all overhead and underground distribution facilities. AM/FM maps are also used by the Regional Dispatch Offices. AM/FM contains an Electrical Connectivity Model of the Distribution System. AM/FM replaces the CH Design system previously used to do graphical design.
- PowerPlant: A standalone Asset Management system containing records of capitalized assets including poles, transformers, capacitors, regulators, and reclosers. This system must be updated when new equipment is installed or equipment is removed/salvaged from a functional location. CREWS automatically sends asset information to PowerPlant when the work request is closed.
- SAP R/3: FE's enterprise system. Due to the size of the databases the system was split into Shared Services, Customer Care Services East (CCSE) and Customer Care Services West (CCSW).
 - Shared Services: contains orders (SAP R/3 document used to plan the operations and resources for performing the work outlined in the notification), notifications (SAP R/3 document used to track a work request) and substation business partners (third party suppliers, vendors). Also contained in Shared Services are modules for Materials Management, Project Systems, Plant Maintenance and Accounts Payable.
 - CCSE: Customer Care Services East is part of the SAP R/3 System and contains business partner (ratepayers, potential ratepayers, third party suppliers, vendors, customers, etc.) information and service notifications for Penelec, MetEd and JCP&L.
 - CCSW handles the same information as CCSE for Cleveland Electric Illuminating, Ohio Edison, Toledo Edison, and Penn Power.
- SDCS: Substation Data Collection System is a stand-alone system capturing all inspection data from substation inspections. The inspection data is loaded into a handheld computer for uploading to the main SDCS system. The SAP R/3 Plant Maintenance (PM)

module in Shared Services uses the uploaded data. SDCS is implemented in the FE Ohio regions and implementation is planned for NJ in 4th quarter 2003.

A new version of the PowerOn Outage Management System was also rolled out in June 2003. The new version will improve switching operations and outage prediction. Key enhancements include allowing the more accurate prediction of outages on a per phase basis and allowing single customer outage prediction based on a customer call rather than predicting the customer's transformer as out.

In addition to the new version of PowerOn, there are several efforts involving data improvement that will also enhance the accuracy of outage assessment:

- The backlog of Work Requests awaiting update posting in GIS (construction complete but GIS not yet updated) has been dramatically reduced in the last year. The CNJ Region backlog was reduced from approximately 8,000 in March of 2002 to approximately 600 in March of 2003. The NNJ Region backlog was reduced from approximately 11,000 in March of 2002 to less than 200 in March 2003.
- Processes have been implemented to decrease the turnaround time for changes. The RDO is continuously looking for problems. Corrections are fed directly to Maps & Records for an expected 24-hour turnaround on changes.
- The GIS Audit Project, part of the Accelerated Reliability Improvement Plan (discussed in section 4.2.3) will also help validate the existing system configuration.

The application systems, architecture and data for FE's Regions are periodically assessed for opportunities for improvement. Figure 14 shows a depiction of the 2004 vision for the Transmission and Distribution application systems.

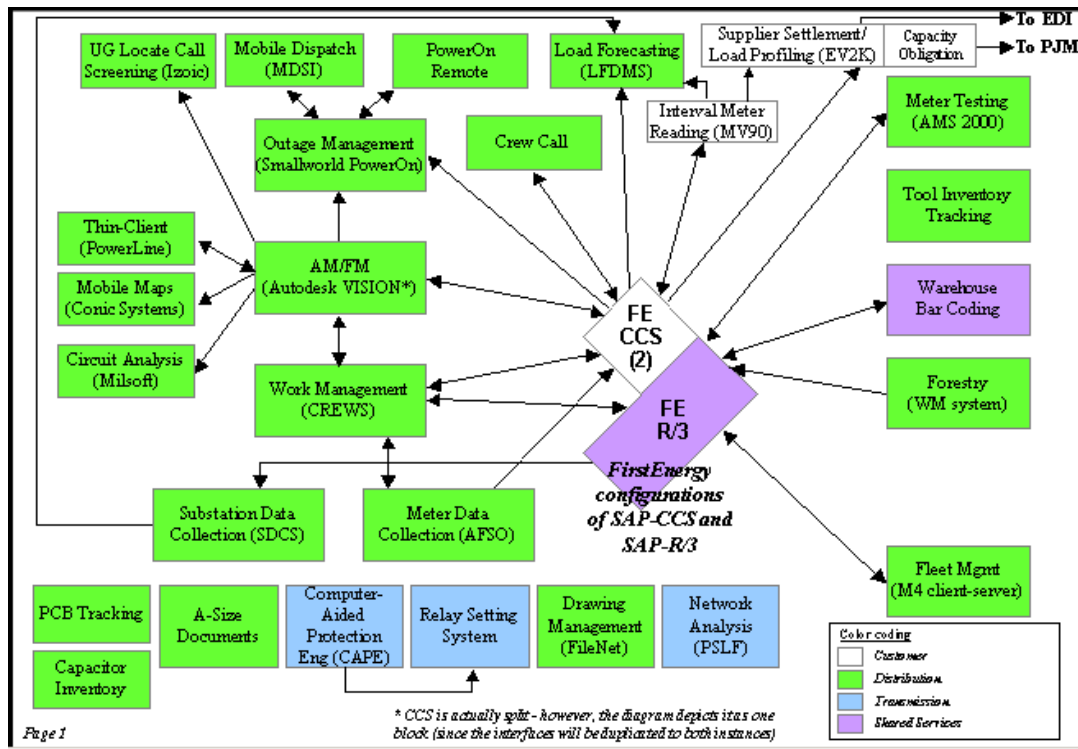


Figure 14
2004 T&D Application Portfolio Vision

4.2.2.2 Findings and Conclusions

- 1) **The recently-deployed CREWS/SAP system and processes will improve planning, scheduling, coordination, and reporting of work.**
 - GPU utilized the SAP ERP system for work management. CREWS provides an easier to use front-end for planners and schedulers.
 - CREWS is a work management system customized to FE's specifications to provide functionality specifically to the T&D environment.
 - Using CREWS capabilities (estimating/planning, scheduling, managing, reporting, etc.) in conjunction with SAP capabilities (preventive/periodic maintenance) provides a comprehensive work management solution for a T&D environment.

- CREWS/SAP will enable better tracking of Actual vs. Planned labor hours in the CNJ and NNJ Regions.
 - FE's Buddy System (providing New Jersey users with existing FE user contact) will facilitate a smoother transition to the new CREWS/SAP system and processes.
 - Although CREWS has a priority field for designating a work request's ranking, the training material on the CREWS system and processes did not indicate any formal prioritization process or method.
- 2) **FE has recently made several technology improvements that will increase outage prediction accuracy, and has processes in place to continually assess and enhance systems and data.**
- PowerOn's key enhancements in the June 2003 upgrade include allowing more accurate prediction of outages on a per-phase basis, and allowing single-customer outage prediction based on a customer call rather than predicting the customer's transformer as being out.
 - Processes have been implemented to decrease the turnaround time for changes to the GIS system, and the RDO is continuously monitoring for GIS discrepancies. Corrections are fed directly to the regional Maps & Records for an expected 24-hour turnaround on changes. The GIS Audit Project, part of the ARIP (discussed in 4.2.3.1.3), will also help validate the existing system configuration.
 - Application systems, architecture, and data are periodically assessed for improvement opportunities. Improvement opportunities are reviewed and authorized by a corporate Project Management Office (PMO). However, the regions have a significant sponsorship role.

4.2.2.3 Recommendations for Improvement

1) **Develop and deploy a formal work prioritization system. (Reference Conclusion No. 1)**

Description: Develop and deploy a formal comprehensive work prioritization system for line work that includes preventative and corrective maintenance, as well as New Business work. Utilize the priority field in CREWS.

Benefit: All work is prioritized based on the same criteria, allowing for optimal resource usage.

Cost: Develop, document, train, and deploy the methodology.

Priority: Medium

4.2.3 Reliability

4.2.3.1 Background and Current Situation

In December of 1999 JCP&L implemented a new Outage Management System (OMS), called PowerOn. In the years since 1999, PowerOn has enabled the CNJ and NNJ Regions to better capture reliability metrics, specifically CAIDI, SAIDI and SAIFI.

FE approaches reliability from a customer perspective. FE research has determined that customers evaluate a utility based on two aspects: performance during sustained outages and the frequency of momentary interruptions.

CAIDI, SAIDI, and SAIFI do not fully account for these important aspects of customer perception of reliability. In addition to these traditional measures, FE has adjusted its method of reliability measurement and the distribution circuit protection design to better address reliability from the customer's perspective using CRI.

Figures 15-21 compare the various reliability metrics for the nine FE Regions and other New Jersey utilities for the years 1999 through 2002. Data was not available in all cases, and the method of gathering and synthesizing the data also may vary by utility and by year, so comparison is somewhat tenuous.

As an example, JCP&L's reliability metrics from 1999 and earlier are not directly comparable to the metrics of subsequent years because of the major change in the method of gathering data (OMS vs. manual).

In addition, the master data in the OMS/GIS systems has errors that impact the accuracy of system generated statistics. Correction of the GIS data is currently being addressed as part of the ARIP, and processes are in place to prevent future degradation and to resolve data problems as they arise.

Figures 15-19 present a comparison of reliability metrics for all FE regions. These metrics use the same major event exclusion to be comparable, specifically where 6% of customers are affected for

greater than 12 hours. The former GPU Regions used different criteria to calculate CAIDI and SAIFI, thus the data for 1999 and 2000 is not applicable.

	New Jersey ¹		Pennsylvania		Ohio				
Year	Central	Northern	Eastern	Western	Central	Eastern	Northern	Southern	Western
2002	123.05	178.75	115.70	137.54	75.53	91.15	163.82	83.25	77.26
2001	125.47	161.75	139.19	122.97	68.60	90.08	113.30	81.08	116.43
2000	*	*	*	*	92.73	101.33	119.33	77.65	105.23
1999	*	*	*	*	79.85	87.47	122.69	76.99	117.71

Figure 15
FE CAIDI by Regions

	New Jersey ²		Pennsylvania		Ohio				
Year	Central	Northern	Eastern	Western	Central	Eastern	Northern	Southern	Western
2002	1.090	1.380	1.630	1.850	1.450	1.500	0.890	1.070	1.290
2001	1.006	1.119	1.035	1.311	1.273	1.379	0.934	0.985	1.096
2000	*	*	*	*	1.310	1.406	0.909	1.453	1.505
1999	*	*	*	*	1.265	1.280	0.796	1.251	1.293

Figure 16
FE SAIFI by Regions

	New Jersey ³		Pennsylvania		Ohio				
Year	Central	Northern	Eastern	Western	Central	Eastern	Northern	Southern	Western
2002	4.80	3.44	7.03	7.89	3.83	3.55	2.81	3.81	3.83
2001	*	*	*	*	3.97	4.72	2.87	4.54	2.29
2000	*	*	*	*	3.92	5.23	3.56	4.56	4.34
1999	*	*	*	*	4.88	4.82	4.54	4.33	5.01

Figure 17
FE MAIFI by Regions

¹ *FE Region metrics use the same major event exclusion to be comparable, specifically where 6% of customers are affected for greater than 12 hours. The former GPU Regions used different criteria to calculate CAIDI, thus the data for 1999 and 2000 was not calculated.

² *FE Region metrics use the same major event exclusion to be comparable, specifically where 6% of customers are affected for greater than 12 hours. The former GPU Regions used different criteria to calculate SAIFI, thus the data for 1999 and 2000 was not calculated.

³ *MAIFI not calculated for former GPU Regions 1999-2001

	New Jersey ⁴		Pennsylvania		Ohio				
Year	Central	Northern	Eastern	Western	Central	Eastern	Northern	Southern	Western
2002	0.210	0.211	0.529	0.348	0.304	0.272	0.138	0.159	0.348
2001	*	*	0.306	0.287	0.291	0.225	0.178	0.160	0.287
2000	*	*	*	*	0.292	0.258	0.223	0.186	0.447
1999	*	*	*	*	0.277	0.223	0.201	0.183	0.567

Figure 18
FE Total # Lockouts/Total # Circuits by Regions

	New Jersey ⁵		Pennsylvania		Ohio				
Year	Central	Northern	Eastern	Western	Central	Eastern	Northern	Southern	Western
2002	64.16%	59.19%	57.51%	52.93%	78.77%	76.85%	73.14%	84.15%	76.92%
2001	*	*	*	*	79.95%	72.37%	80.25%	85.08%	73.45%
2000	*	*	*	*	78.84%	65.20%	71.98%	76.84%	54.95%
1999	*	*	*	*	72.34%	75.41%	72.88%	80.57%	54.91%

Figure 19
FE % of Circuits w/ CRI<130-YTD by Regions

Figures 20 and 21 present a comparison of CNJ and NNJ with other New Jersey utilities' operating regions. These metrics exclude major events based on the BPU definition of 10% of customers in an operating region interrupted for a duration of greater than five minutes.

	JCP&L		PSE&G				Connectiv	Rockland
Year	Central	Northern	Central	Metro	Palisades	Southern	Atlantic	
2002	127	187	89.42	129.53	83.55	92.74	105.94	100
2001	126	161	61.05	98.20	73.12	96.15	77.16	97
2000	205	319	77.37	88.45	87.79	100.81	91.55	114
1999	132	175	76.67	107.30	124.18	115.51	92.73	93

Figure 20
CAIDI Comparison New Jersey Utilities

- The CAIDI for CNJ and NNJ for 2000 are meaningless due to significant data issues.
- For 2002, CNJ has the third highest CAIDI out of eight operating regions in New Jersey.
- For 2002, NNJ has the highest CAIDI out of eight operating regions in New Jersey.

⁴ *Not calculated for former GPU Regions 1999-2001

⁵ *Not calculated for former GPU Regions 1999-2001

	JCP&L		PSE&G				Connectiv	Rockland
Year	Central	Northern	Central	Metro	Palisades	Southern	Atlantic	
2002	1.06	1.34	0.79	0.94	0.77	0.74	1.066	1.64
2001	0.98	1.10	0.52	0.74	0.36	0.57	0.674	1.22
2000	1.83	2.74	0.48	0.43	0.47	0.66	0.682	1.18
1999	0.60	0.74	0.54	0.59	0.47	0.67	1.001	1.15

Figure 21
SAIFI Comparison New Jersey Utilities

- The SAIFI for CNJ and NNJ for 2000 are meaningless due to significant data problems.
- For 2002, CNJ has the fourth highest SAIFI out of eight operating regions in New Jersey.
- For 2002, NNJ has the second highest SAIFI out of eight operating regions in New Jersey.

4.2.3.1.1 Circuit Reliability Index

FE uses the Circuit Reliability Index (CRI) as a measure of circuit performance and expected customer satisfaction. The CRI measures the three components of reliability: Impact, Frequency and Duration.

$$CRI = (5.14 * MAIFI) + (.45 * CAIDI) + (24.3 * SAIFI) + (26.5 * Lockouts)$$

FE considers a CRI with a value of less than 130 good. This value is based on customer feedback for sustained and momentary outages. Several years of survey have confirmed 130 to be a good target.

The CNJ and NNJ Regions each have regular meetings to review poor performing circuits and recommend actions. Actions may include:

- Targeted tree trimming (outside the normal cycle)
- Installing additional animal protection
- Installing additional protective devices (fuses, circuit breakers, etc.)
- Field inspection of the circuit
- Developing a capital project to improve the specific circuit's reliability

Based on a review of both the derivation of the CRI and application of the CRI in other FE Regions, the CRI is deemed a sound method for identifying problem circuits upon which to concentrate maintenance efforts. The use of CRI in the FE Ohio Regions has resulted in stabilized reliability.

4.2.3.1.2 Design to Minimize Momentary Interruptions

FE utilizes fuses on branch circuits to avoid both momentary interruptions and lockouts to large numbers of customers while trading off an interruption to a much smaller number of customers.

Although this protection approach may increase CAIDI, SAIDI and SAIFI, from the customers' perspective, it is believed a corresponding decrease in MAIFI will more than offset any increase in the other metrics. If SAIFI data indicates a high frequency of interruptions on a circuit, reclosers may replace fuses on selected branches.

In addition to minimizing momentary interruptions, the use of fuses in conjunction with the OMS makes localizing an outage more accurate, which reduces outage duration.

4.2.3.1.3 Accelerated Reliability Improvement Plan

The ARIP was initiated by FE/JCP&L to compress the timeframe required to improve reliability in the CNJ and NNJ Regions. The Plan consists of many individual projects, some of which will have a direct impact on reliability metrics and others that will improve the decision making capability of the RDO.

The ARIP projects are listed in Figure 22.

1)	Accelerated Vegetation Management Program: To reduce tree-related outages, the amount of trimming scheduled for 2003 and 2004 is being increased to complete the remaining three years of a four-year cycle in two years.
2)	CRI Enhancements: Accelerated review of 2002 reliability data, identify outage causes and recommend solutions to prevent re-occurrences. The review is to focus on high impact protection coordination solutions including installing additional fusing/reclosing locations, prioritizing tree trimming schedules, direct maintenance and capital projects, and reviewing data integrity and operational, maintenance and design issues.
3)	34.5kV System Circuit Coordination: To improve circuits with poor CRI numbers review the current 34.5kV system to determine recommendations to change relay settings and operating practices, perform corrective maintenance and install additional protective equipment.
4)	Substation Distribution Metering Upgrade: To improve the ability to monitor loading of distribution feeder and substation transformers in the CNJ and NNJ Regions. An accurately measured distribution load will improve planning and asset utilization.
5)	GIS Field Audit: Audit of GIS data to improve OMS/GIS accuracy.
6)	CNJ Regional Dispatch Office: Currently both the CNJ and NNJ Regions are handled by the same RDO in Morristown. A separate RDO will be established in CNJ.
7)	Distribution Capacitors: For voltage support, this project will install 100MVAR of distribution capacitors in the CNJ Region and 100MVAR in the NNJ Region.
8)	34.5 kV SCADA: To improve circuits with poor CRI numbers remote controlled sectionalizing devices will be added to the 34.5 kV system, and controls will be added to existing non-automated switches. This will improve both switching capability and restoration of circuit capability.
9)	Mobile Capacitor Banks: Purchase a 36 kV, 14.4/21.6 MVAR mobile capacitor bank for CNJ Region and one for NNJ Region. These capacitors can be installed quickly to address system events, such as loading/low voltage due to high electric usage, and moved as system conditions change.
10)	OMS Upgrade: Upgrade to PowerOn Outage Management System to improve RDO flexibility. This is in addition to the June 1, 2003 upgrade discussed Section 4.2.2.

Figure 22
ARIP Projects

Although the CNJ and NNJ Regions have not explicitly linked the ARIP projects to explicit reliability targets, we have found these projects to be linked to an overall reliability improvement process. In addition, it appears that the ARIP projects do not contain a phase to verify that the ARIP implementation yielded expected results. In fact, the expected results of the ARIP have not been

defined in terms of their expected impact on reliability metrics beyond references to “reduce” or “improve.” See Figure 23 for the generic process.

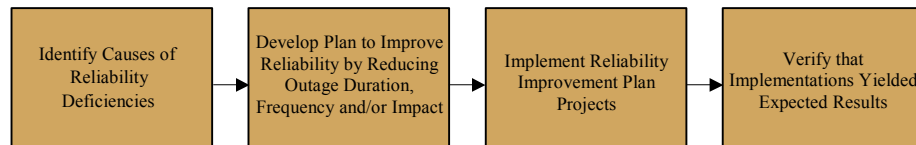


Figure 23
High Level Generic Reliability Improvement Process

4.2.3.1.4 Regional Variations

During our analysis of regional reliability statistics across all New Jersey utilities, we found that comparisons between regions can be skewed. This is driven partly by a BPU regulatory definition that excludes data relating to outages affecting more than ten percent of the customers of a region interrupted for a duration of greater than five minutes. As each utility has determined their operating regions and therefore, the resulting square miles of area and customer density, and since major events are usually storm induced and storms are generally localized, excluding a major event may result in reliability statistics that are skewed in favor of regions with smaller areas and higher customer densities.

This situation is demonstrated in the following hypothetical example:

Consider two operating regions with the following characteristics.

	Region X	Region Y
Area (square miles)	1,500	400
Customers	500,000	500,000
Customers per square mile	333	1,250

Figure 24

For Region X and Y an event would be considered a major event if 50,000 customers are affected (10%). If it is assumed that a localized storm affects 150 square miles in each of these regions and that all customers in this storm area

are without power then in Region X 49,950 customers would be affected and 187,500 would be affected in Region Y. The event, however, would be excluded only for Region Y.

	Region X	Region Y
Customers per square mile	333	1,250
"Major Event" Definition (10%)	50,000	50,000
Customers affected by 150 square mile storm	49,950	187,500
Storm data excluded from reliability calculations?	No	Yes

Figure 25

As a result, the likelihood is that a region with higher customer density will exclude a greater number of major events from reported statistics than a region with lower customer density, thereby raising the reported reliability of the higher density region.

4.2.3.1.5 Reliability Improvement Precedents

Following the 1998 merger of Ohio Edison and Centerior Energy to form FE, the Centerior Energy Companies, Cleveland Electric Illuminating (CEI) and Toledo Edison (TE) adopted the CRI methodology/CRI Team approach. Figures 26-35 below present the CRI, CAIDI, SAIFI, MAIFI and Lockout metrics for the years 1996-2002 for both companies.

Recalling that the CRI is calculated using CAIDI, SAIFI, MAIFI and Lockouts, the figures indicate how some of the reliability metrics were stabilized and others reduced based on focusing on the Circuits with CRI greater than 130. Following the merger, both CEI and TE had significant OMS/GIS data problems identified and resolved, so movement in the 1999 and 2000 data should be viewed in this context.

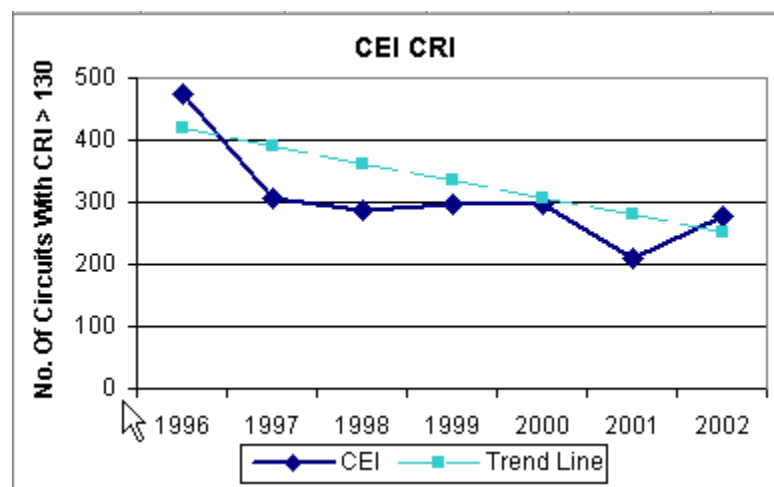


Figure 26
CEI Number of Circuits with CRI>130 1996-2002

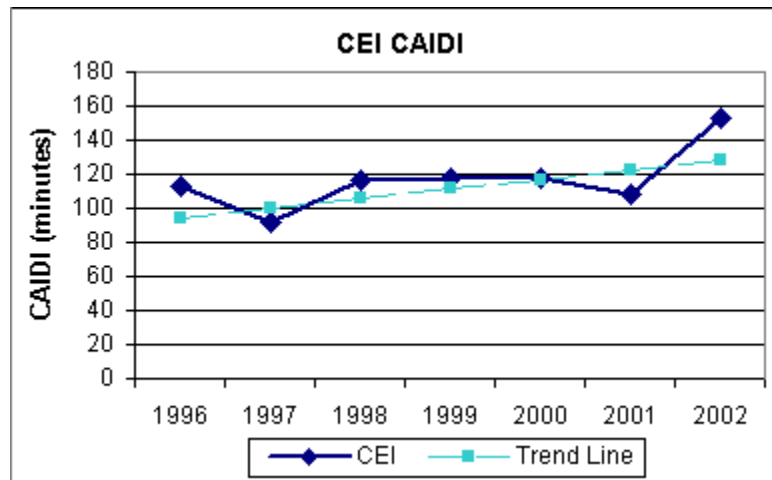


Figure 27
CEI CAIDI 1996-2002

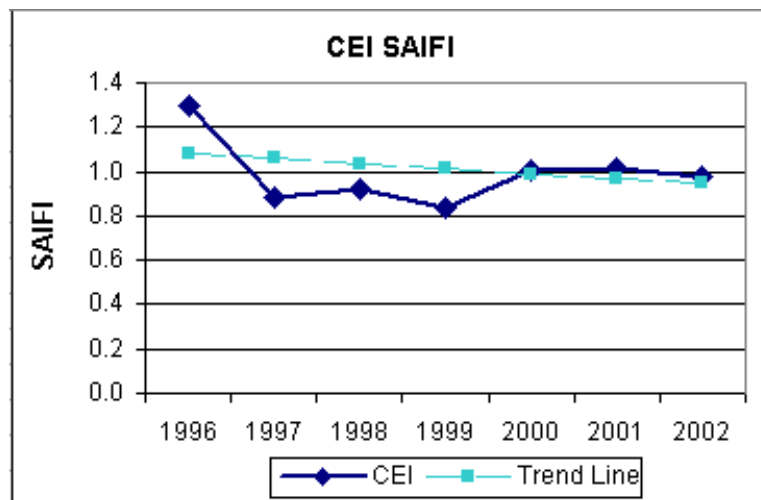


Figure 28
CEI SAIFI 1996-2002

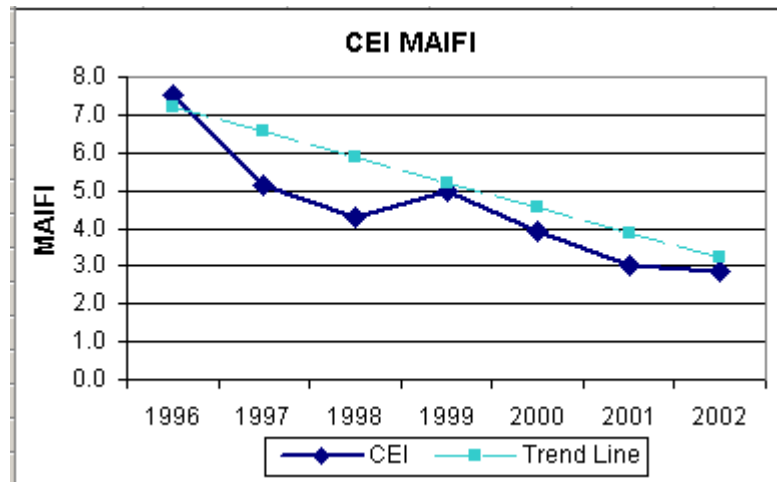


Figure 29
CEI MAIFI 1996-2002

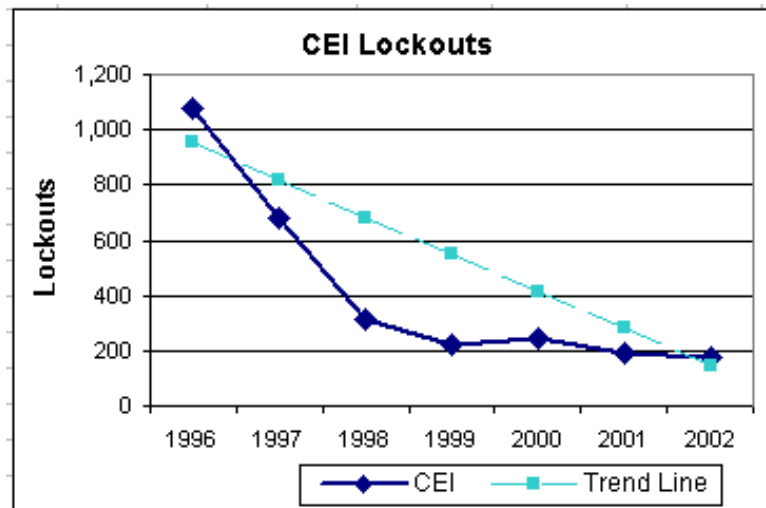


Figure 30
CEI Lockouts 1996-2002

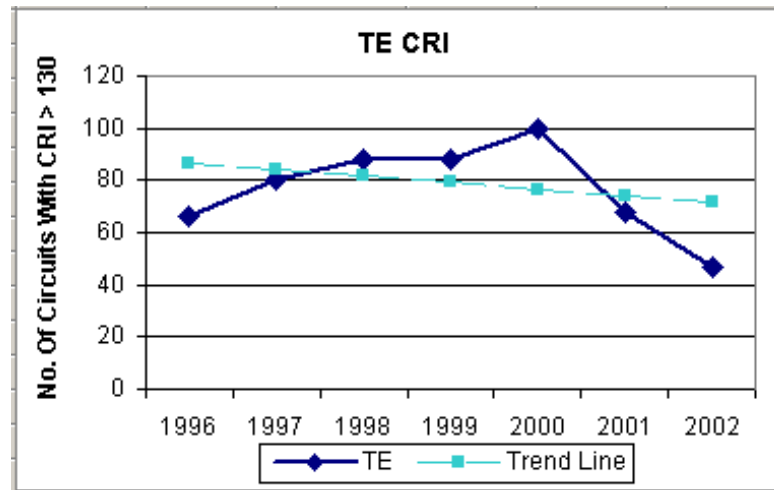


Figure 31
TE Number of Circuits with CRI>130 1996-2002

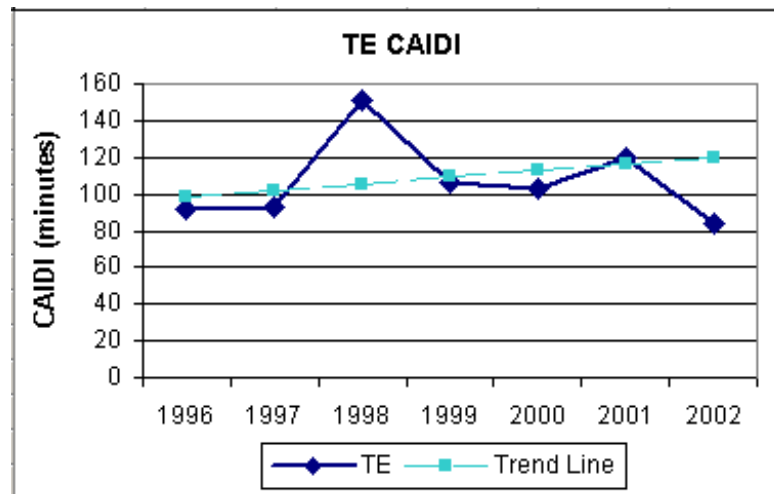


Figure 32
TE CAIDI 1996-2002

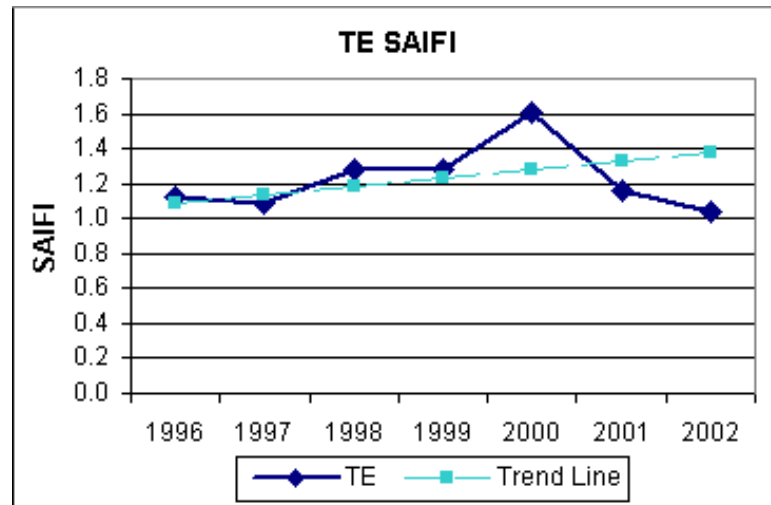


Figure 33
TE SAIFI 1996-2002

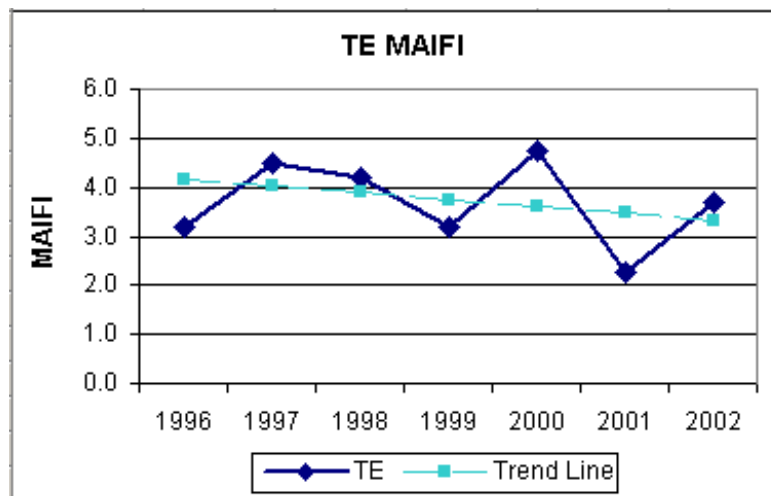


Figure 34
TE MAIFI 1996-2002

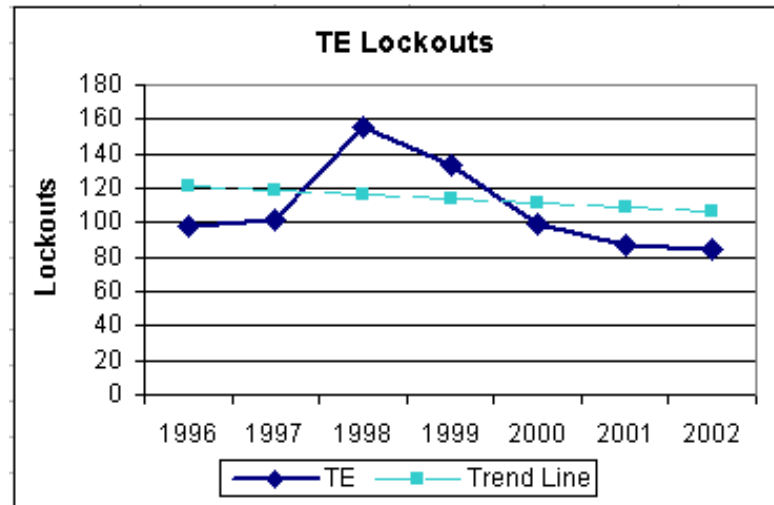


Figure 35
TE Lockouts 1996-2002

4.2.3.2 Findings and Conclusions

- 1) **The CAIDI, SAIDI, and SAIFI metrics for CNJ and NNJ have had limited accuracy but the situation is being comprehensively addressed.**
 - The JCP&L 1999 and earlier reliability metrics are not directly comparable to the metrics of subsequent years because of the major change in the method of gathering data (OMS versus manual).
 - The master data in the OMS/GIS systems has errors that have been accumulated through 2001. This has impacted the accuracy of the reported statistics.
 - Correction of the data is currently being addressed as part of the ARIP.
 - Processes are in place to prevent future degradation and to resolve data problems as they arise.
- 2) **Identifying a trend in any of the reliability metrics for CNJ and NNJ is not possible since only one year of meaningful data is available.**
 - Figures 15 - 19 contain JCP&L reliability data collected over the last four years. However, the information has not been collected with the same level of accuracy over these four years. This makes inter-year comparison of SAIFI, SAIDI and CAIDI values almost meaningless.

- With respect to the Circuit Reliability Index (CRI), it was only after the merger that the JCP&L regions started calculating it. This was further complicated due to lack of accurate momentary interruption data.
- 3) **Regulatory reporting requirements may not allow a meaningful comparison of reliability metrics between New Jersey operating regions (JCP&L – 2 regions, PSE&G – 4 regions, Connectiv – 1 region, Rockland – 1 region).**
- A region with higher customer density may exclude a greater number of major events from reported statistics than a region with lower customer density, thereby increasing the reported CAIDI and SAIFI of the lower density region.
 - Additional insight into the calculation of the different reliability indices by the other NJ utilities would be needed to ensure an “apples-to-apples” performance comparison. As reported in a 2003 EEI survey, not all utilities uniformly calculate and report the most common reliability metrics including CAIDI, SAIDI and SAIFI.
- 4) **CNJ and NNJ have room for improvement to attain reliability similar to other FE Ohio regions.**
- The 2002 CAIDI, SAIDI, SAIFI, and MAIFI metrics for CNJ and NNJ Regions (JCP&L – 2 regions, PSE&G – 4 regions, Connectiv – 1 region, Rockland – 1 region) indicate distinct room for improvement when compared to the FE Ohio Regions.
 - In 2002, CNJ CAIDI and SAIFI rank third and fourth highest out of eight New Jersey operating regions (JCP&L – 2 regions, PSE&G – 4 regions, Connectiv – 1 region, Rockland – 1 region).
 - In 2002, NNJ CAIDI and SAIFI rank the highest and second highest out of eight New Jersey operating regions (JCP&L – 2 regions, PSE&G – 4 regions, Connectiv – 1 region, Rockland – 1 region).
- 5) **The ongoing and planned changes in T&D O&M practices should result in improved reliability metrics in future years.**
- There is typically a lag between improving T&D O&M practices and actually seeing these results reflected in the reliability metrics. FE experienced a two to three year lag in improvement when the former Centerior companies implemented new O&M practices.

6) Based on a review of both the formulation and the use of the CRI in other FE Regions, it is deemed a sound method for identifying problem circuits upon which to concentrate maintenance and engineering efforts.

- FE uses the CRI to use as a measure of circuit performance and expected customer satisfaction. Using the three components of reliability: Impact, Frequency, and Duration, FE derived the CRI:

$$\text{CRI} = (5.14 * \text{MAIFI}) + (.45 * \text{CAIDI}) + (24.3 * \text{SAIFI}) + (26.5 * \text{Lockouts})$$

- A sampling of New Jersey customer expectations was done to confirm the CRI less than 130 was applicable to the CNJ and NNJ Regions.
- CRI has been successfully used to assess reliability since the 1998 merger of Ohio Edison and the Centerior companies.
- CRI helps identify opportunities for projects and optimize the capital investment by concentrating on the problem areas from a customer perspective.

7) The reason for developing and undertaking the ARIP is sound and we expect it to result in improved reliability.

- The ARIP was initiated by FE/JCP&L to compress the timeframe required to improve reliability in the CNJ and NNJ Regions.
- Most of the ARIP projects will have a direct impact on reliability metrics.
- Some of the ARIP projects will also improve the decision-making capability of the RDO.

8) The ARIP projects are appropriately linked to the JCP&L reliability improvement program.

- The ARIP projects have been planned and undertaken to address weaknesses in the reliability improvement program at JCP&L. As they are being completed, they will help identify, assess and solve reliability problems associated with the T&D Operations and Maintenance at JCP&L.

4.2.3.3 Recommendations for Improvement

1) Periodically review progress against reliability improvements. (Reference Conclusions No. 2, 3, 4, 5, and 7)

Description: Periodically review reliability improvements, including the ARIP projects against a baseline reference.

Cost: No incremental cost, as reliability is currently reviewed monthly by the CNJ and NNJ Regions and annually by the BPU.

Benefit: More reliable analysis of progress, as 2002 data is much more dependable data than that from previous years.

Priority: Medium

2) Modify reliability reporting requirements to include metrics both with and without storm events. (Reference Conclusion No. 3)

Description: Regulators should consider modifying the reliability reporting requirements to include metrics both with and without major events. See Figure 25.

Cost: The costs associated with this recommendation would be those required to modify the BPU regulations and for regulated utilities to collect and report these statistics.

Benefit: Data would be more comparable across utilities by reducing the effect of varying definitions of operating areas.

Priority: Medium

4.2.4 Productivity

4.2.4.1 Background and Current Situation

Productivity refers to a rate of production. As with any prudent business, FE measures productivity to identify opportunities for improvement. Viewing productivity as the “production” per person per year, it can be broken into three components:

- Available work hours per person per year
- Efficiency per hour worked – estimated hours/actual hours to complete a task
- Effectiveness per hour worked – doing the right work.

Increasing any of these components will increase the total production.

4.2.4.1.1 Available Work Hours

Available Work Hours (regular time) per person can be calculated as 2,080 hours per year minus contractual vacation minus contractual holidays minus training time minus average expected sick time minus miscellaneous time (meetings, preparation time, etc.). Some of these hours are fixed and cannot be influenced, while others can be.

- Annual regular hours 2,080 (52 weeks per year and 40 hours per week) are fixed.

-
- Contractual vacation hours are fixed based on contracts and employment agreements.
 - Contractual holiday hours are also fixed based on contracts and employment agreements.
 - Training time could be considered variable to an extent however there most likely would be an impact on safety (accidents causing time-off) and/or efficiency.
 - Average expected sick time is a factor that can be influenced.
 - Miscellaneous time for meetings, preparation time, etc. also can be influenced.

Average sick time is a metric that FE tracks to identify opportunities for improvement. Figure 36 shows the Year End 2002 and Year End 2001 sick time hours per line employee for each region.

In 2001 under GPU Energy, the average sick time per employee in the CNJ and NNJ Regions (92.1 hours and 72.0 hours respectively) exceeded FE (Ohio Regions averaging approximately 38 hours per employee). In other words, the on average in 2001 FE employees were recording half the sick time GPU Energy employees were recording.

The usage of sick time was an obvious area to investigate following the merger. FE determined that sick time in the former GPU Energy Regions was being utilized for other than its designated purpose.

Employees in the CNJ and NNJ Regions were informed that sick time was to be used for sickness only and not for other purposes. The policy is backed up by disciplinary measures up to and including dismissal for misrepresentation of sick time.

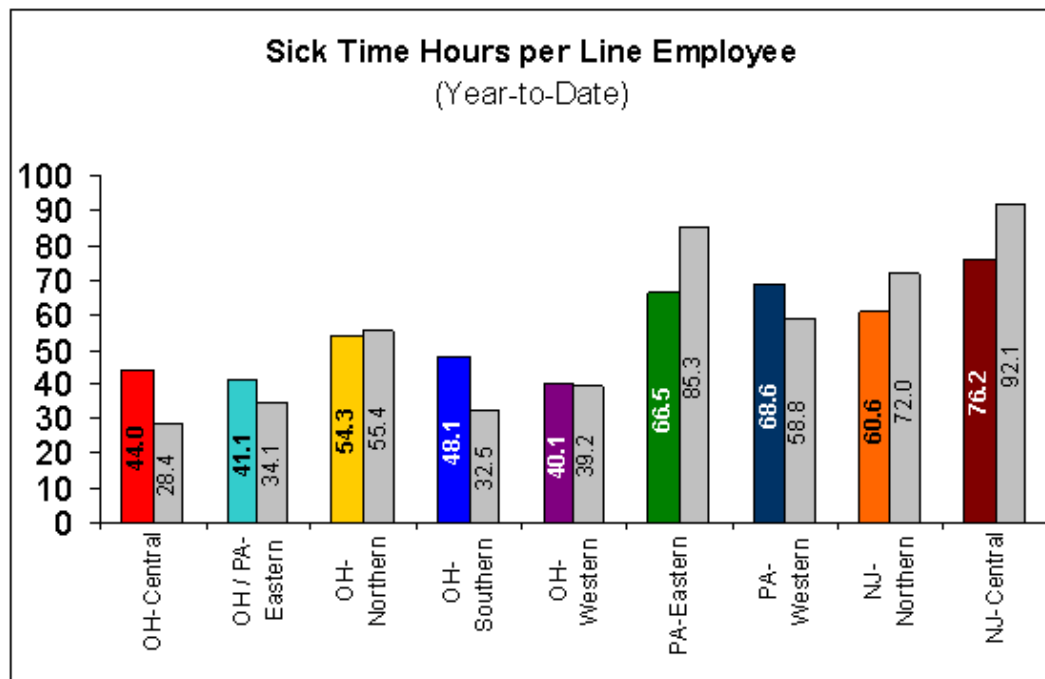


Figure 36
2002 Sick Time Hours per Line Employee
Colored bars represent End of Year 2002 and Gray bars End of Year 2001

As with sick time, miscellaneous time that could include meetings, preparation time, and similar activities can be influenced. Based on interviews with District Operations Managers, the typical day is outlined in Figure 37.

Activity	Central	Northern
Personnel report to morning meeting ready to work in proper work attire	08:00 AM	07:00 AM
Morning Safety Meeting		
Work packages issued		
Load materials		
Inspect vehicles		
Trucks out of the shop	08:30 – 08:45 AM	07:30 – 07:45 AM
Return to District shop no earlier than	04:00 PM	03:00 PM
Chiefs turn in timesheets and work packages. Discuss as necessary.		
Linemen cleans, inspects, restocks and refuels truck		
Wash up		
End of day	04:30 PM	03:30 PM

Figure 37
Preparation and Closeout Typical Day

The difference in start times is due to the desire to avoid the heavy traffic to the extent possible in the NNJ Region.

4.2.4.1.2 Efficiency per Hour Worked

Efficiency can be defined as the ratio of actual hours worked compared to planned hours. This metric can be used to identify possible improvement opportunities. For instance, if the average ratio of actual to planned were 1.2, this would indicate that every 10 hours of planned work was requiring 12 hours of actual time. Likewise a ratio of 0.9 would indicate that for every 9 hours worked 10 hours of planned work was completed.

This metric is an indicator, but the underlying reason(s) for any significant deviation from a ratio of 1.0 requires further investigation. Possible reasons for deviations from an average of 1.0 include any of the following differing from the estimate:

- Material availability
- Vehicle and equipment condition and availability
- Training and experience
- Environmental conditions, e.g., drive times due to traffic, setup time due to site conditions, weather, etc.

- Individual variation in capabilities, effort or attitude

Efficiency is also a metric that FE tracks for each of its regions. FE tracks the actual hours vs. planned hours based on the reimbursable nature of the work, e.g., for “Work Excluding For Profit” and “For Profit Work”.

With the SAP work management system, tracking and comparing actual to planned hours was cumbersome in CNJ and NNJ. The new SAP/CREWS system will provide the CNJ and NNJ Regions the capability to more easily monitor this metric.

Figures 38 and 39 indicate the results for Year End 2001 and 2002 for each type of work. The “For Profit” Work was not captured separately for the former GPU Regions in New Jersey and Pennsylvania.

As shown in Figure 38, the average 2002 ratios for CNJ Region (1.20) and NNJ Region (1.11) indicate there is room for improvement.

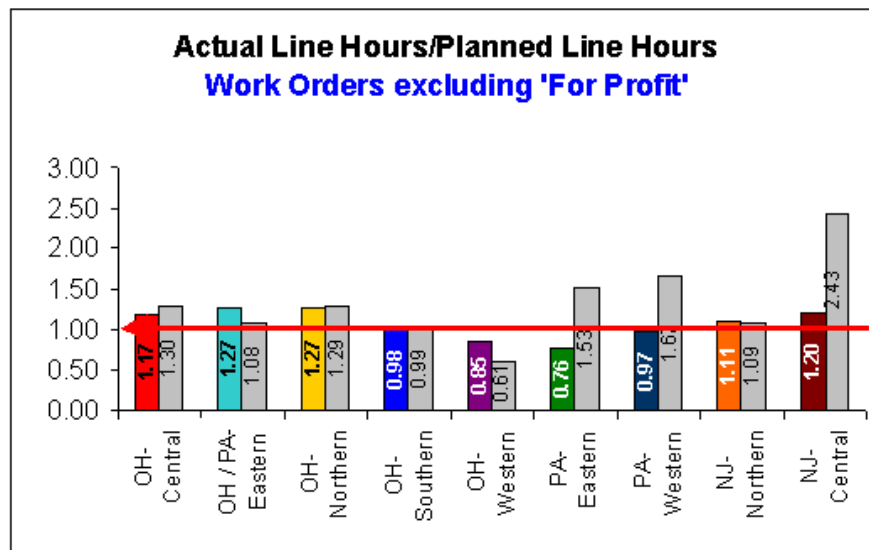


Figure 38
Actual Line Hours/Planned Line Hours
Work Orders excluding ‘For Profit’

Note: Colored bars on the left indicate Year End 2002 data and gray bars on the right Year End 2001 data.

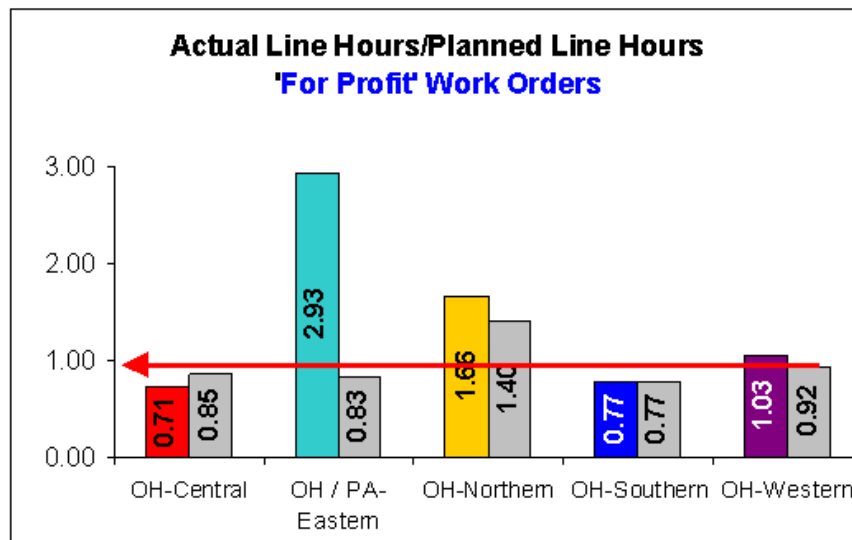


Figure 39
Actual Line Hours/Planned Line Hours
'For Profit' Work Orders

Note: Colored bars on the left indicate Year End 2002 data and gray bars on the right Year End 2001 data.

4.2.4.1.3 Effectiveness per Hour Worked

Effectiveness is the other component of productivity, including measuring the right work being done in the correct order. If a District does not have a backlog of work, this is a moot point. However, in real life backlogs exist and must be managed. The method by which backlog is managed, and whether or not higher priority work is performed first, determines the effectiveness of the utilization of resources.

Because of the changes to the planning and scheduling function in CNJ and NNJ Regions, along with the rollout of the CREWS/SAP system in June 2003, the associated processes are still being adjusted.

However, based on interviews and a review of the training documentation for the CREWS system, a formal documented method of prioritizing normal work is not evident. The FE Storm Process does have a documented strategy and prioritization of work (safety hazards, critical customers, transmission, distribution, and service restoration) along with a priority numbering scheme for PowerOn follow orders. But for most non-emergency work, the prioritization seems to be driven by the "Date Service Desired." As a result, the prioritization of corrective maintenance (non-emergency, correct before failure) was not evident in the overall scheduling of line work. Substation work was more rigorously prioritized, but substation maintenance impacts by new business are lower.

Other than the practice of prioritizing system reinforcement projects to the first half of the year (to be in place for peak demand) and the statutory requirements for service connections a consistent method of prioritization was not evident.

4.2.4.1.4 Overtime to Increase Available Hours

Overtime is one way to increase the available hours without increasing the overall size of the workforce. However, management should continually review use of overtime to determine when sustained overtime reaches a point that is considered excessive and there is need for additional staff.

Figure 40 summarizes 2002 Average Overtime Hours per Line Employee per Month for all FE regions. The CNJ and NNJ Regions (31.9 hours and 37.6 hours respectively) are higher but are still comparable to the FE Ohio Regions (ranging from 14.7 hours to 34.4 hours).

With ARIP, the changes in processes and systems, and the improvements evident in efficiency, the CNJ and NNJ Regions have not reached a point where a determination of the need for additional workforce can be made based on overtime alone.

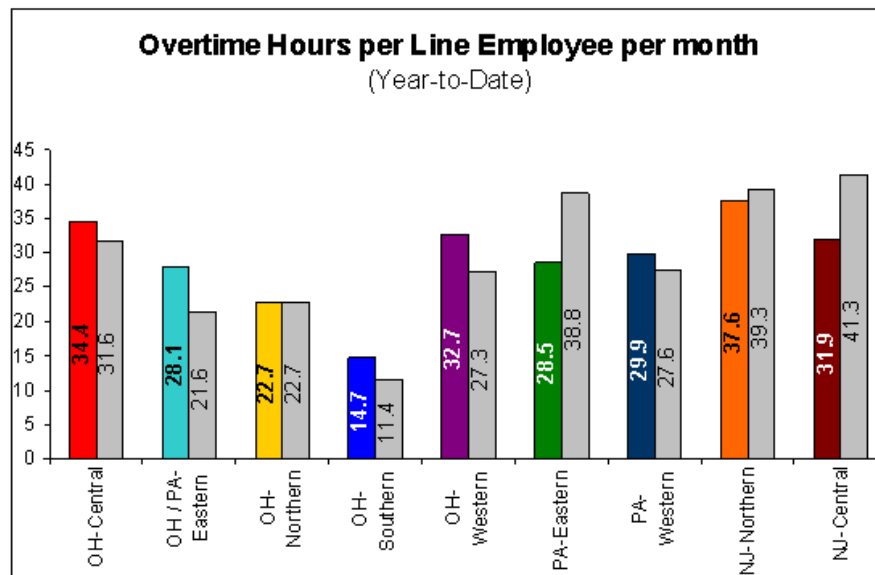


Figure 40
2002 Overtime Hours per Line Employee per Month
Note: Colored bars on the left indicate Year End 2002 data and gray bars on the right Year End 2001 data.

The CNJ and NNJ 16-hour guideline, which calls for a rest period after 16-hours of work, is a common industry practice. MAMA mutual assistance criteria have a similar guideline and most other FE Regions work under a similar safety rule. Although the 16-hour guideline may impact productivity by reducing the total available hours, it does provide a reasonable checkpoint to assess work requirements versus safety. Working 16 or more hours in a hazardous environment, where concentration in an absolute necessity, does present increased safety concerns.

4.2.4.1.5 Equipment and Material Availability

We examined equipment and material availability as it relates to impacting the performance of work. During our conversations with District Managers and Supervisors, they indicated that equipment is generally adequate for the staffing and workload, and is well maintained and available when needed.

A review of 4th Quarter fleet metrics indicated that downtime for vehicles and lost hours of productivity were higher in CNJ and NNJ than in the five FE Ohio Regions. The average percentage of overdue fleet preventive maintenance jobs was also higher in CNJ than in the five Ohio Regions, but NNJ was comparable to the Ohio Regions. However, the significance of the overdue preventative maintenance could not be determined because an average days overdue metric was not available.

As part of the merger integration, FE reviewed JCP&L inventory levels and found them to be higher than the average of the FE Ohio regions. CNJ and NNJ are addressing these high material inventory levels to be more in line with FE practices. Excess material in district line shops has been moved to regional locations and material delivery frequency to line shops has been increased. District Operations Managers have control over their emergency stock levels and can increase the district's levels as required.

Based on interviews material stockouts are minimal and generally do not impact scheduled work. A review of the 4th Quarter storeroom metrics substantiated high inventory levels for both CNJ and NNJ. The material availability metric was not available for CNJ or NNJ due to the systems being used in 2002, but the material availability in the five Ohio Regions ranged from 99.61% to 99.92%. Due to the June 2003 conversion to the CREWS/SAP system, this metric will be captured going forward for CNJ and NNJ.

4.2.4.2 Findings and Conclusions

- 1) FE is adequately addressing JCP&L bargaining unit sick time usage to better align with other FE operating companies' experience.**
 - Personnel described how this practice expanded as a result of no consequences for abusing the sick time policy. No business can tolerate this type of practice and remain competitive.
 - FE has enforced existing policies regarding abuse of sick time. It has taken disciplinary action against violators up to and including dismissal. For example, employees found fishing after having called in sick were terminated.
 - There has been improvement in reported sick time metrics but more can be done. For 2002 Year End, the average sick time per employee in CNJ and NNJ Regions (76.2 hours and 60.6 hours respectively) still exceeded Ohio Regions (averaging approximately 45.5 hours per employee). This was an improvement but still indicated an approximately 50% on average greater usage of sick time in the New Jersey Regions than in the Ohio Regions.

- On average the change from 2001 to 2002 did have the effect of increasing the available hours in the CNJ Region and NNJ Region combined by approximately 20,000 hours (using 2002 Year End employee statistics).
- 2) **The efficiency per hour worked for CNJ and NNJ Regions can be improved further, and the regions are working toward attaining this goal.**
- The ratio of Planned Hours vs. Actual Work Order Hours will vary by work order, but an average of 1.0 is a reasonable target.
 - The average 2002 ratios Planned vs. Actual Work Order Hours (excluding for profit) for CNJ Region (1.20) are 20% higher than the target. Refer to Figure 38.
 - The average 2002 ratios Planned vs. Actual Work Order Hours (excluding for profit) for NNJ Region (1.11) are 11% higher than the target. Refer to Figure 38.
 - CNJ and NNJ have eliminated unnecessary meetings and have better utilized their workforce during inclement weather.
- 3) **Overtime usage in the CNJ and NNJ Regions is high compared to other FE Regions.**
- 2002 Average Overtime Hours per Line Employee per Month, the CNJ and NNJ Regions (31.9 hours and 37.6 hours respectively) are still comparable to the FE Ohio Regions (ranging from 14.7 hours to 34.4 hours).
 - Based on the revised call out procedures, job classifications such as linemen have seen overtime spread more evenly across all linemen.
- 4) **Equipment availability is adequate for the levels of staffing and workload for both the CNJ and NNJ Regions.**
- According to District Operations Managers and Crew Supervisors equipment is available when needed.
 - A review of fleet metrics contained in the FE Energy Delivery Business Quarterly Metrics reports substantiates the observations of good equipment availability.

5) Vehicles and equipment, in general, are well maintained and have no negative impact on work performance.

- According to District Operations Managers and Crew Supervisors, vehicles and equipment are well maintained. An exception to this may be some of the transmission specific equipment in the NNJ Region.
- A review of fleet metrics contained in the FE Delivery Business Quarterly Metrics reports substantiates the observations of good equipment maintenance. However, the average downtime for vehicles in CNJ and NNJ are substantially higher than FE Ohio Regions.
- The condition of equipment does not seem to be contributing to accidents.

6) Material stock outs for planned work are minimal and do not significantly impact the completion of work.

- According to District Operations Managers and Crew Supervisors equipment is available when needed.
- A review of material metrics contained in the FE Energy Delivery Business Quarterly Metrics reports substantiates the observations good material availability.
- There have been and will continue to be individual problems with material availability as the CNJ and NNJ Regions continue their transition to a reduced inventory stock in the District locations and regionalized materials management with retail/packaged jobs to individual District line shops.
- The average inventory values in CNJ (2002 Year End approximately \$6.4 million) and NNJ (2002 Year End approximately \$7.1 million) Regions are high compared to the average inventories carried in other FE Regions (2002 Year End approximately \$2.0 million for Ohio Regions). A plan is in place and being executed to draw down the inventories in a prudent manner.
- The lead times for non-emergency material requests are reasonable based on the proper planning.
- Safety equipment is readily available.

7) The average daily preparation time for district crews is reasonable.

- The average daily preparation time for district crews is approximately 30 to 45 minutes and is comparable to that of a large Midwest utility and a large West Coast utility.
- Daily preparation includes a safety meeting, issuing work, drawing materials, vehicle inspection and possibly refueling if not done in the previous afternoon.

- Total preparation time over the course of a week is less when alternate schedules (e.g., 4 days x 10 hours) are utilized.
- 8) **The 16-hour guideline, a common industry practice, provides a reasonable checkpoint to assess work requirements versus safety.**
 - The 16-hour guideline may impact the amount of work a fixed workforce can accomplish in a given 24-hour period.
 - There is a safety implication for working 16 plus hours in a hazardous environment where staying focused is an absolute necessity.
 - FE has work rules setting a 16-hour limit followed by a mandatory 8-hour rest period in Ohio and parts of Pennsylvania.
 - MAMA mutual assistance criteria also stipulates crews on loan to another utility will be given the consideration of a full 8-hour rest period in a 24-hour period.
- 9) **Preventive maintenance and emerging corrective maintenance work requests are informally prioritized which may result in lower than desirable priorities.**
 - JCP&L could not provide a documented process for prioritizing non-emergency work that includes corrective maintenance.

4.2.4.3 Recommendations for Improvement

- 1) **Consolidate responsibility for maintenance of transmission equipment. (Reference Conclusion No. 5)**

Description: Although TC&M was disbanded in the NNJ Region, the responsibility for maintenance of equipment used exclusively for transmission work should be consolidated. Equipment was distributed to districts but has not been maintained consistently due to low usage.

Cost: Minimal to ensure periodic maintenance of equipment.

Benefit: TC&M equipment is ready when needed.

Priority: High

2) Include average days overdue for preventative maintenance work (PM) in the fleet metrics. (Reference Conclusion No. 5)

Description: The fleet metrics should include an average days overdue for all PMs overdue.

Cost: Data should be available for calculation in the fleet maintenance system. Time to design and program a report.

Benefit: This metric puts the metric for average percent of overdue fleet preventive maintenance jobs in context. 100% of PMs overdue by an average of one day is probably not a problem but 20% of PMs overdue by an average of 30 days could indicate a problem.

Priority: Low

3) Increase the utilization of Alternative Schedules as provided for in the Agreement and Supplements between JCP&L and Union. (Reference Conclusion No. 7)

Description: Increase the utilization of Alternative Schedules, namely four 10-hour days, for projects.

Benefit: This should be considered a positive for both employees and the company. Employees benefit from the reduced number of workdays and commensurate drive time (setting aside the call out issue). The company benefits from the reduction in setup/shutdown time for the week.

Cost: Minimal.

Priority: High

4) Document operations processes / practices. (Reference Conclusion No. 9)

Description: Document all operations processes / practices in revision-controlled documents.

Cost: The cost is dependent upon the scope. The first step of the process should be an assessment to determine the scope of work required.

Benefit: Will capture and propagate practices in a controlled manner. Formal procedures for common processes and practices can accelerate the rate of the experience learning curve for line and substation crews. It takes considerably longer to acclimate to work practices if the transfer of knowledge is dependent on oral communication and demonstration. Also, the consistency of the practices deteriorates with the passing of time and the greater number of people passing along the information.

Priority: High

4.2.5 Work Force Requirements

4.2.5.1 Background and Current Situation

The workforce requirements for a utility typically vary over time. Factors such as customer growth, system growth, condition of the system, workforce demographics, workforce experience, experience requirements, technology changes and process changes all must be considered in determining the appropriate size of a utility's workforce.

Although the FE CNJ and NNJ Regions are both under the umbrella of Jersey Central Power & Light, they are analyzed as separate entities to reflect how they are operated.

Our analysis considered ratios including various workload measures compared to all transmission and distribution personnel in the region and also specifically to linemen. For the purposes of this analysis linemen are defined as Chiefs, Chief Bs, Linemen 1/C, Linemen Apprentices, URD Coordinators, URD Equipment Operators, URD Leaders, and URD Technicians. Comparisons are made to other FE Regions and to other New Jersey Utilities (as data was available). Most of the FE data for the analysis is from 2002. In some cases the information for other utilities was not available for 2002 and the previous year's data is used as noted.

Basically, the purpose of our analysis was to determine if the CNJ and NNJ Regions have an adequate workforce as compared to the other FE Regions and to the other New Jersey utilities, namely Connectiv, Rockland Electric and PSE&G. Due to regional and utility variations (system configuration, customer density, environment, etc.) a conclusion as to the adequacy of a workforce cannot be drawn based on one ratio alone. Thus, several will be used as the data allows determining if there is a consistent outcome in the comparisons.

The data contained in Figures 41-57 were used to analyze the current workforce referred to in the Findings and Conclusions.

4.2.5.1.1 Regional Variations

Data for the other New Jersey Utilities, PSE&G, Connectiv and Rockland Electric, was provided by the BPU. Based on an analysis of the data available from the BPU, a comparison of the FE CNJ and NNJ Regions with PSE&G Regions is most applicable. PSE&G data was the most complete and the four PSE&G regions were comparable in customer size to the FE CNJ and NNJ Regions.

Since the Rockland Electric data includes personnel shared with New York and Pennsylvania, and the customer base is much smaller than CNJ's and NNJ's, a comparison was not deemed useful.

The FE CNJ and NNJ Region data is based on Year End 2002.

The PSE&G customer data is based on Year End 2001 and the personnel information is based on October 2002 data.

	JCP&L		PSE&G				Connectiv	Rockland
	Central	Northern	Central	Metro	Palisades	Southern	Atlantic	
Customers	598,467	439,786	478,512	502,537	532,570	488,522	496,678	69,994
Service Area Square miles	1,344	1,912	370	190	205	680	2,700	207
Distribution Circuit Miles	20,117	21,625	43,944				8,457	1,429
Personnel	841	695	531	454	460	574	387	227
OH Linemen	234	142	192***	173***	165***	207***	N/A	107 **
URD Linemen	31	28	-	-	-	-	-	34 **
Customers/ Personnel	712	633	901	1,107	1,158	851	1,283	308
Customers/ Linemen	2,258	2,587	2,492	2,905	3,228	2,360	N/A	490
Distribution Circuit Miles/Linemen	76	127	60				N/A	10.13

Figure 41
Work Load/Staffing Comparison New Jersey Utilities

** Orange & Rockland 107 linemen shared throughout O&R (NJ, NY & PA)

*** PSE&G includes both overhead & underground construction & maintenance

As shown by Figure 41:

- All four PSE&G Regions have more customers per regional employee than CNJ and NNJ.
- All four PSE&G Regions have more customers per lineman than CNJ.
- Two PSE&G Regions have more customers per lineman, and two PSE&G Regions have less than NNJ.
- CNJ and NNJ have more distribution circuit miles per lineman (76 and 127 respectively) than the PSE&G average (60).
- Pole miles, a better benchmark for resource requirements, were not available for PSE&G.

Figure 42 presents the work metrics for all FE Regions. The best regions for comparison with CNJ and NNJ are the five Ohio Regions. The two Pennsylvania Regions were also GPU pre merger and

have not been operating with the new practices and processes long enough to provide a valid benchmark.

	New Jersey		Pennsylvania		Ohio				
	Central	Northern	Eastern	Western	Central	Eastern	Northern	Southern	Western
Customers	598,467	439,786	509,008	583,818	503,724	483,022	693,191	171,980	376,799
Service Area	1,912	1,344	3,274	17,615	1,410	4,290	980	2,050	3,255
Distribution Pole Line Miles	8,037	8,967	14,683	19,205	9,542	14,170	11,661	5,202	8,530
Distribution Circuit Miles	20,117	21,625	34,593	39,122	15,951	24,372	24,522	8,723	15,517
Transmission Line Miles	1,192	1,392	1,406	2,726	2,190	2,117	1,068	1,085	1,482
T&D Substations	144	143	229	402	140	203	181	82	127
T&D Line Miles	9,229	10,359	16,089	21,931	11,732	16,287	12,729	6,287	10,012
Line Services Personnel	426	320	277	430	218	274	319	96	205
Total T&D Personnel	841	695	587	839	499	567	767	223	427
Line/Total Personnel	51%	46%	47%	51%	44%	48%	42%	43%	48%
Customers/ Line Personnel	1,405	1,374	1,838	1,358	2,311	1,763	2,173	1,791	1,838
Customers/ Total Personnel	712	633	867	696	1,009	852	904	771	882
T&D Line Miles/Line Personnel	22	32	58	51	54	59	40	65	49

Figure 42
FE Work Metrics by Regions

As shown in Figure 42:

- CNJ and NNJ have fewer customers per total regional personnel (712 and 633) than any of the five FE Ohio Regions (range 771 to 1,009).
- CNJ and NNJ have fewer customers per line personnel (1,405 and 1,374) than any of the five FE Ohio Regions (range 1,763 and 2,311).
- CNJ and NNJ have fewer T&D Line Miles per Line Personnel (22 and 32) than any of the five FE Ohio Regions (range 40 to 65).

4.2.5.1.2 Workforce Demographics

One point that was repeatedly raised in meetings with IBEW representatives was that they expect a large number of retirements before December 2004, and using only the PSI program as a replacement conduit will lead to a serious reduction in the workforce numbers. The existing IBEW contract expires in December 2004 and the IBEW expects a subsequent contract may not have as beneficial of a retirement plan, thus providing an incentive for members to retire early.

A number of position classifications were examined to determine the average age and average experience with the company (although not necessarily experience in their current position) for the personnel in these positions in the CNJ and NNJ Regions. The results, based on Year End 2002 data, are presented in Figure 43

Classification*	Central Region			Northern Region		
	Number	Average Age	Average Experience	Number	Average Age	Average Experience
LC&M I/C	130	42.7	14.6	70	43.4	17.7
LC&M Chief	26	51.5	34.4	13	57.2	37.0
LC&M Chief B	72	48.3	26.9	53	51.8	28.5
LC&M 1st Yr Apprentice	-	-	-	1	49.8	18.0
LC&M 2nd Yr Apprentice	6	30.2	6.3	5	33.9	7.8
URD Coordinator	3	60.0	39.0	2	56.3	36.0
URD Equipment Operator	6	45.3	19.7	5	45.3	19.0
URD Leader	10	45.9	21.7	10	48.0	23.5
URD Technician A	12	46.6	20.3	11	46.1	16.9
Relay Tech Sr	11	48.8	36.3	8	46.6	22.0
Relay Tech	5	52.5	25.2	0	-	-
Relay Tech Jr	1	37.4	16.0	2	44.1	23.0

Figure 43
Select Personnel Classification Analysis⁶

Further analysis was performed by looking at the distribution of the age of personnel in December 2004. Age 58 was assumed the early retirement age. The ratios used for comparison (customers/T&D personnel, customers/linemen, circuit miles/linemen) were re-calculated assuming all personnel who

⁶ No personnel were assigned to classification LC&M 2/C.

are at least 58 years old on December 2004 retired and there was no inflow of personnel. The number of customers and distribution circuit miles was held at 2002 numbers. The results are presented in Figure 44.

JCP&L December 2004		
Metric	Central	Northern
Customers	598,467	439,786
Distribution Circuit Miles	20,117	21,625
Total Personnel <58 years age	691	597
Total Bargaining Unit	597	475
OH Linemen < 58	194	104
URD Linemen <58	28	25
Customers / Total Personnel	866	737
Customers / Linemen	757	760
Distribution Circuit Miles / Linemen	91	168

Figure 44
December 2004 Analysis Assuming Retirements at Age 58

As shown by Figure 44, if all regional personnel greater than or equal to 58 years of age retired in 2004, and there were no replacements:

- The total CNJ personnel would decrease from 841 to 691.
- The total NNJ personnel would decrease from 695 to 597.
- The CNJ number of customers per total regional personnel metric (866) would be within the current range of the five Ohio Regions (771 to 1,009).
- The NNJ number of customers per total regional personnel metric (737) would be lower than the current range of the five Ohio Regions (771 to 1,009).
- The CNJ and NNJ customers per lineman (2,696 and 3,409) are comparable to the current range of the PSE&G Regions (2,332 to 3,202).
- The CNJ and NNJ distribution circuit miles per lineman (91 and 168) are higher than the current PSE&G average (60).

Figures 45-57 present the distribution of age for some selected classifications in December 2004.

- Figures 45 and 52 show LC&M 1/C (Linemen First Class) are primarily grouped in the 40 to 45 year old range with few retirements projected.

- Figures 46, 47, 53 and 54 show LC&M Chiefs and Chief B positions will probably see substantial retirements in the next few years.
- Retirements in Chief and Chief B positions will allow qualified Linemen First Class to move into open positions.

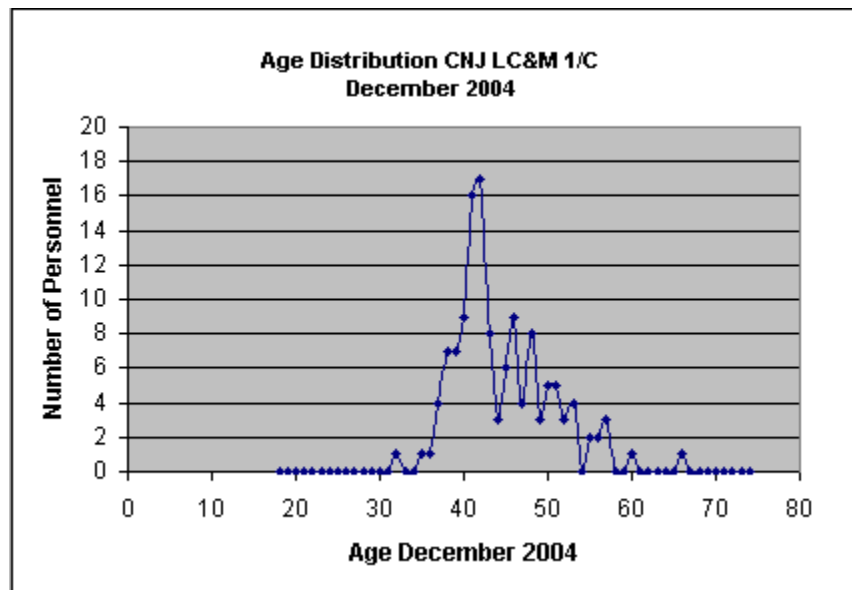


Figure 45
Age Distribution CNJ LC&M 1/C December 2004

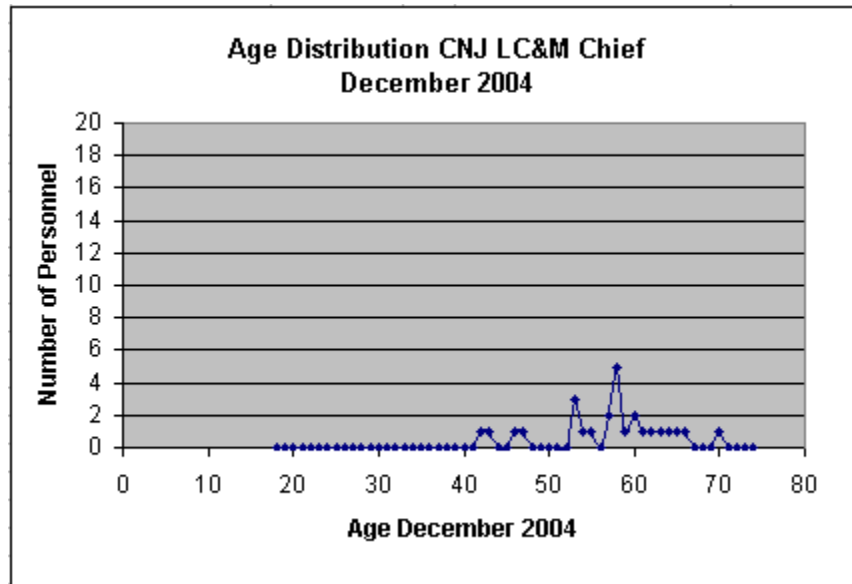


Figure 46
Age Distribution CNJ LC&M Chief December 2004

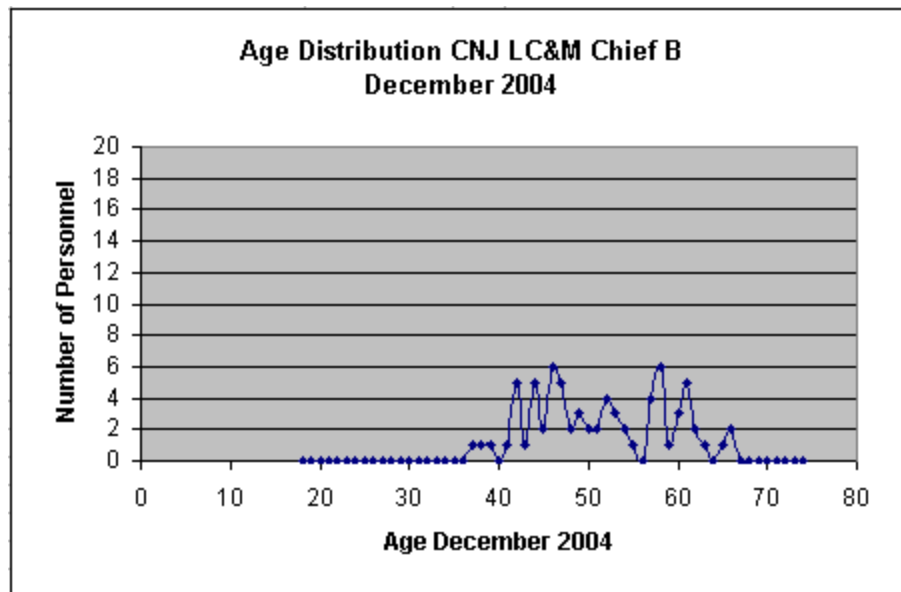


Figure 47
Age Distribution CNJ LC&M Chief B December 2004

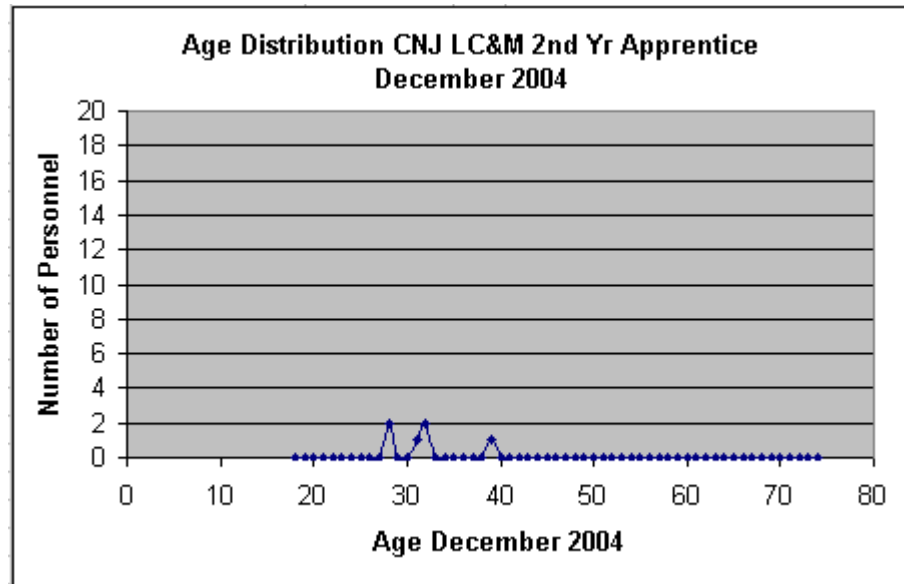


Figure 48
Age Distribution CNJ LC&M Apprentice December 2004

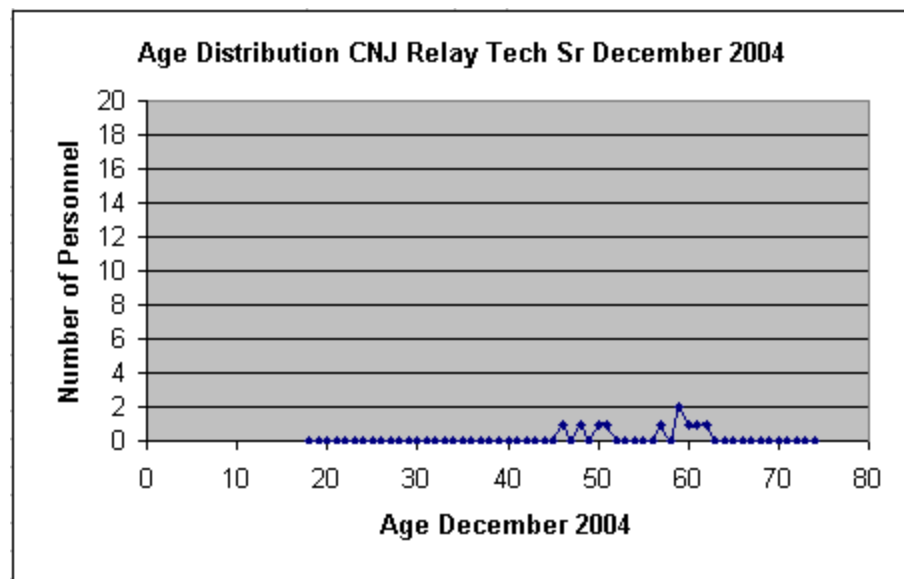


Figure 49
Age Distribution CNJ Relay Tech Sr December 2004

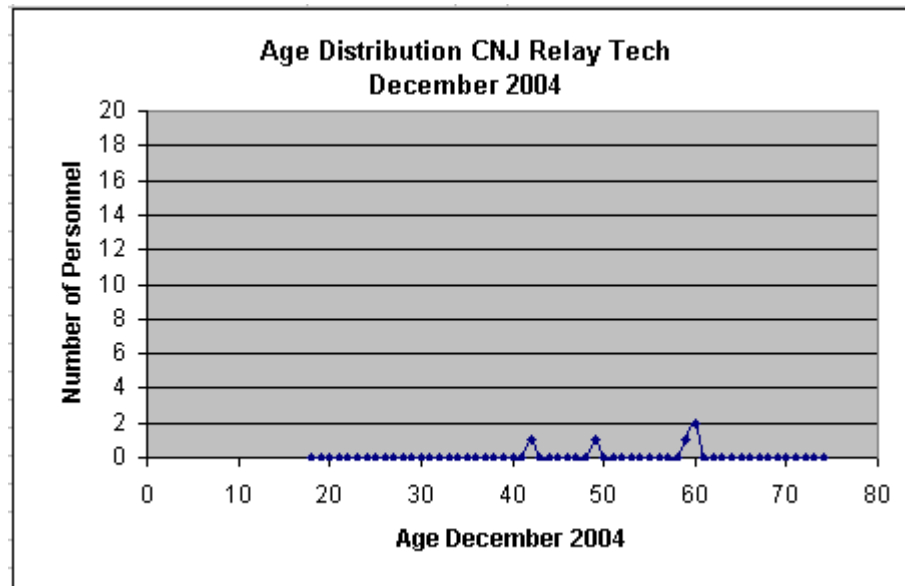


Figure 50
Age Distribution CNJ Relay Tech December 2004

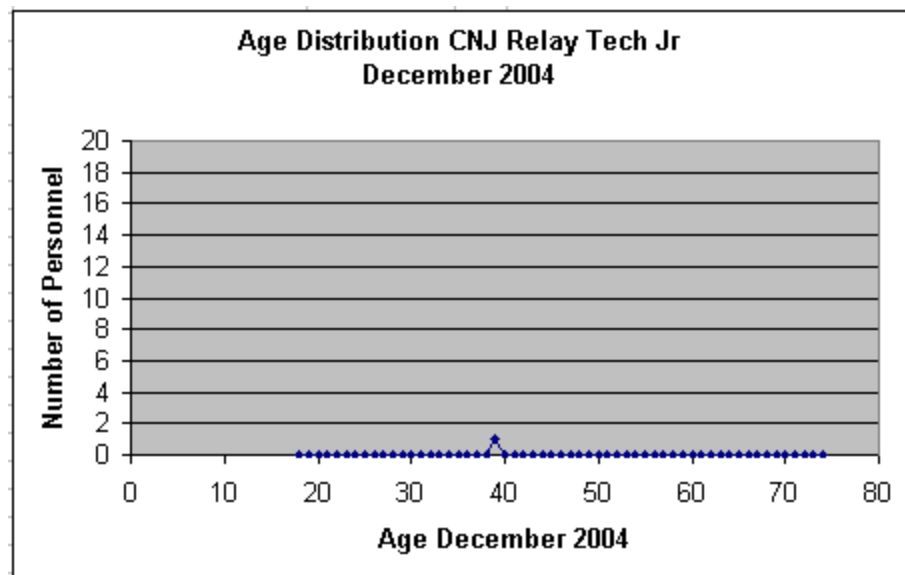


Figure 51
Age Distribution CNJ Relay Tech Jr. December 2004

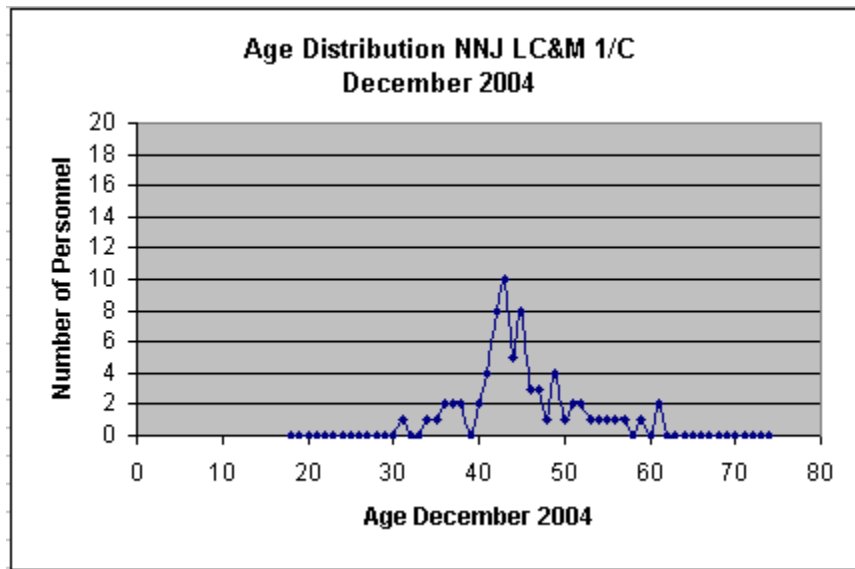


Figure 52
Age Distribution NNJ LC&M 1/C December 2004

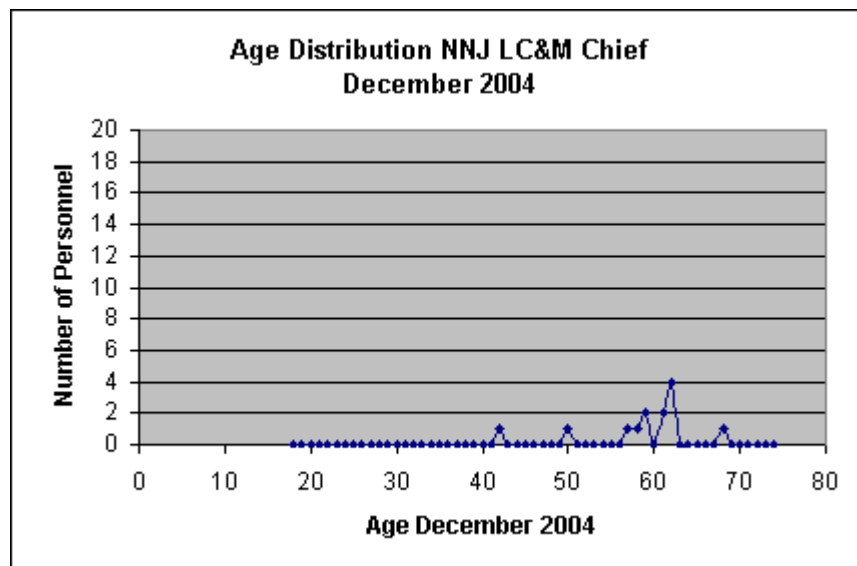


Figure 53
Age Distribution NNJ LC&M Chief December 2004

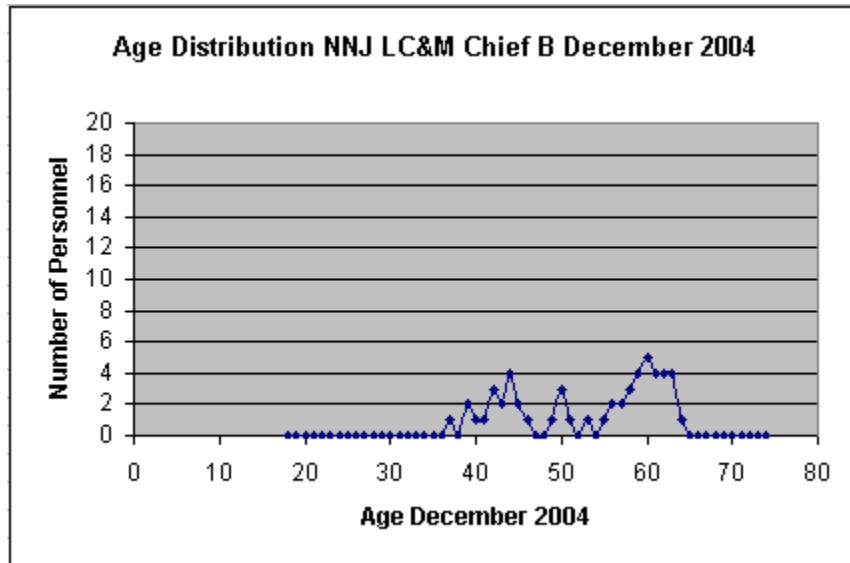


Figure 54
Age Distribution NNJ LC&M Chief B December 2004

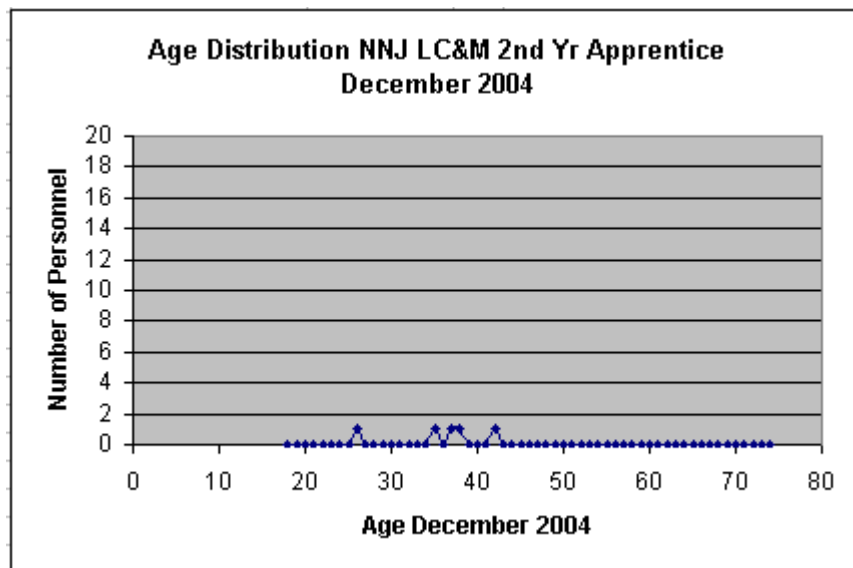


Figure 55
Age Distribution NNJ LC&M Apprentice December 2004

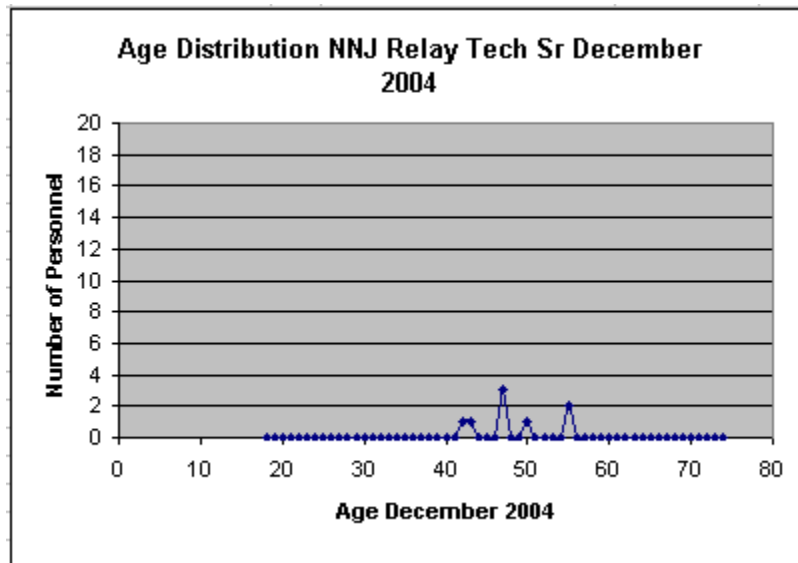


Figure 56
Age Distribution NNJ Relay Tech Sr December 2004

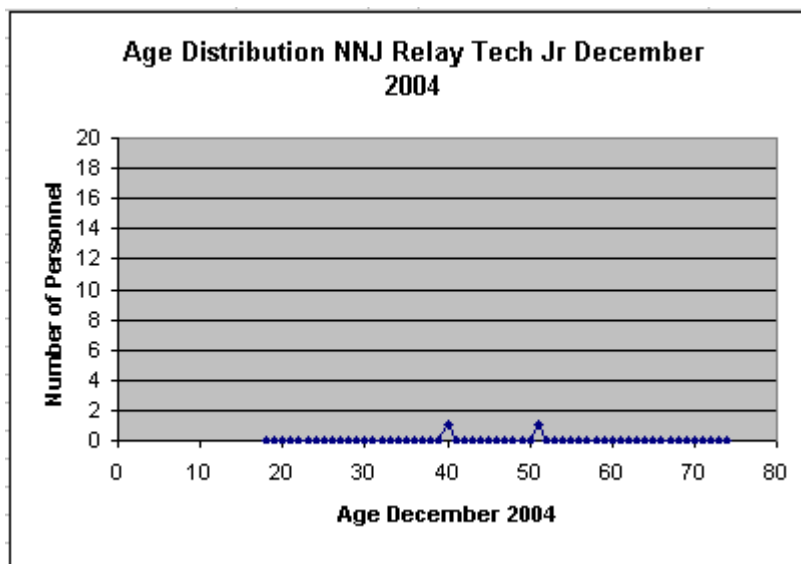


Figure 57
Age Distribution NNJ Relay Tech Jr December 2004

4.2.5.1.3 Use of Contractors

In general, the CNJ and NNJ Regions are using contractors for vegetation management and any overflow of capital projects beyond the immediate capacity of internal resources due to schedule requirements.

The next few years should see an increase in capital projects due to the ARIP projects and changes in the system to improve other performance factors. After that period, the number of capital projects is expected to diminish toward a steady state based on growth and steady improvement.

The use of contractors for vegetation management and for capital projects is a common practice throughout the transmission and distribution industry.

4.2.5.2 Findings and Conclusions

- 1) **The overall staffing of the CNJ Region is more than adequate to meet projected steady state work requirements based on customer base and system mile comparisons.**
 - The ratio of Customers/T&D Personnel for the CNJ Region (712) is approximately 29% less than the average ratio for the four PSE&G Regions (1,004).
 - The ratio of Customers/Linemen (where Linemen are defined as Overhead linemen and Underground linemen) for the CNJ Region (2,258) is approximately 18% less than the average ratio for the four PSE&G Regions (2,746).
 - The ratio of Distribution Circuit Miles/Linemen for CNJ (76) is approximately 27% greater than the average ratio for the four PSE&G Regions (60).
 - The ratio of Customers/Line Personnel for the CNJ Region (1,405) is approximately 29% less than the average ratio for the five Ohio FE Regions (1,975).
 - The ratio of Customers/Total T&D Personnel for the CNJ Region (712) is approximately 19% less than the average ratio for the five Ohio FE Regions (884).
 - The ratio of T&D Line Miles/Line Personnel for the CNJ Region (22) is approximately 59% less than the average ratio for the five Ohio FE Regions (54).
- 2) **The projected December 2004 overall staffing of the CNJ Region assuming retirements of all personnel at least 58 years of age and no inflow of additional personnel is adequate to meet projected steady state work requirements based on customer base and system mile comparisons.**
 - The projected December 2004 ratio of Customers/Total T&D Personnel for the CNJ Region (866) is approximately 2% more than the Year End 2002 average ratio for the five Ohio FE Regions (884).

- The projected December 2004 ratio of Customers/Linemen for the CNJ Region (2,696) is approximately 2% less than the Year End 2002 the average ratio for the four PSE&G Regions (2,746) and approximately 16 % less than the highest ratio for a PSE&G Region (Palisades 3,228).
 - The projected December 2004 ratio of Circuit Miles/Linemen for the CNJ Region (91) is approximately 52% greater than the 2002 average ratio for the four PSE&G Regions (60).
- 3) **The overall staffing of the NNJ Region is more than adequate to meet projected steady state work requirements based on customer base and system mile comparisons.**
- The ratio of Customers/T&D Personnel for the NNJ Region (633) is approximately 37% less than the average ratio for the four PSE&G Regions (1,004).
 - The ratio of Customers/Linemen for the NNJ Region (2,587) is approximately 6% less than the average ratio for the four PSE&G Regions (2,746).
 - The ratio of Distribution Circuit Miles/Linemen for NNJ (127) is approximately 112% greater than the average ratio for the four PSE&G Regions.
 - The ratio of Customers/Line Personnel for the NNJ Region (1,374) is approximately 26% less than the average ratio for the five Ohio FE Regions (1,975).
 - The ratio of Customers/Total T&D Personnel for the NNJ Region (633) is approximately 28% less than the average ratio for the five Ohio FE Regions (884).
 - The ratio of T&D Line Miles/Line Personnel for the NNJ Region (32) is approximately 40% less than the average ratio for the five Ohio FE Regions (54).
- 4) **The projected December 2004 overall staffing of the NNJ Region assuming retirement of all personnel at least 58 years of age and no inflow of additional personnel is adequate to meet projected steady state work requirements based on customer base and system mile comparisons.**
- The projected December 2004 ratio of Customers/Total T&D Personnel for the CNJ Region (737) is approximately 17% less than the Year End 2002 average ratio for the five Ohio FE Regions (884). This indicates there is still room for customer growth given the same level of T&D personnel or there is still room for T&D Personnel attrition.
 - The projected December 2004 ratio of Customers/Linemen for the NNJ Region (3,409) is approximately 24% greater than the Year End 2002 the average ratio for the four PSE&G Regions (2,746) and approximately 5% greater than the highest ratio for a PSE&G Region (Palisades 3,228).

- The projected December 2004 ratio of Circuit Miles/Linemen for the NNJ Region (168) is approximately 280% greater than the 2002 average ratio for the four PSE&G Regions (60).
- Staff qualifications are adequate for the current workload profile. However, further analysis is required by job classification and location particularly for some of the highly specialized areas such as relay technicians.

5) The use of contractors for vegetation management with regular and comprehensive inspection of work is a reasonable practice.

- Contracting vegetation management is a common practice in the utility industry.
- Vegetation management without proper inspection to verify results against standards leads to a degradation over a period of time regardless of who performs the work. FE implemented 100% inspection on tree trimming work in 2002 with the regional forestry concept.

6) The use of contractors for overflow capital project work is a reasonable practice.

- Contracting overflow capital projects is a common practice in the utility industry.

7) There are job classifications that may see a disproportionate number of personnel retiring in 2004.

- The relay technician job classification may suffer a higher level of attrition than other classifications in 2004.

4.2.5.3 Recommendations for Improvement

1) Perform succession planning by job classification. (Reference Conclusion No. 7)

Description: A detailed analysis by job classification of the possible attrition rates.

Cost: Minimal, as partial analysis has already been done by FE.

Benefit: Long-term succession planning will minimize workforce disruptions.

Priority: High

4.2.6 Training

4.2.6.1 Background and Current Situation

JCP&L and GPU Energy utilized apprenticeship programs to train line and substation personnel.

FE changed its approach to training from apprenticeship to the Power Systems Institute (PSI) training in 2000. The goal of this two-year program is:

“To educate and train future FE Transmission and Distribution employees, implementing a cost avoidance business model in a ‘just-in-time’ delivery before current job incumbents retired.”

The curriculum for the program was developed and reviewed by FE personnel including bargaining unit employees. PSI was designed to impart, hone and test the skills, knowledge, and attitudes required for conducting transmission and distribution work.

There are two PSI programs. One is designed to train Overhead Line Workers and the other to train Substation Construction and Maintenance Workers. The programs will both be offered in New Jersey starting in the Fall 2003. The PSI training includes the FE storm process.

The Associate Degree program takes a total of 21 months to complete. The typical week is split 50/50 between college courses at a participating college and skills training at an FE facility. There is a 12-week paid coop with FE during the second semester of the program. Students pay tuition and the program is also subsidized by FE.

To determine the enrollment needs for the program, the demographics of the current workforce (age, eligibility for retirement, etc.), the lag time of the training and the estimated program attrition rate are taken into account.

Relay technicians and other specialty areas receive formal and on the job training but not through a PSI type format.

In New Jersey, PSI is recruiting 12 line worker and 10 substation students to commence the first PSI Program at Raritan Valley Community College on September 3, 2003. 27 candidates in New Jersey

have completed step two of the PSI selection process. Step three, the Wood Pole School, will be conducted on July 14-25, 2003. Figure 58 presents statistics on the PSI program as implemented in Ohio.

Year	Graduates	FE Job Offers	Offers Accepted	Notes
2002	22 from two Ohio Colleges	20	20	2 graduates not offered job and are working for other utilities
2003	40 graduates from four Ohio colleges	32	32	2 offers pending, 2 waiting, and 4 not offered jobs
2004				43 Line worker and 13 Substation students are currently working for FE completing their summer field experience.
2005				Ohio currently recruiting 44 line worker and 20 substation students to start the PSI program in September 2003

Figure 58
PSI Ohio Program

4.2.6.2 Findings and Conclusions

1) The PSI program will provide Overhead Line Workers and Substation Workers in adequate numbers to meet JCP&L's needs.

- The program is a mix of course work and practical field training.
- The program includes a climbing school similar to an apprenticeship program that will filter those not physically suited to the job.
- The program has a proven track record in other FE Regions.
- The program enrollment targets account for lag times, retirements and program attrition in the line and substation positions.
- This type of external training is common in the industry and used by at least seven utilities including Dominion, Duquesne, Pacific Gas and Electric, Southern California Edison, Pennsylvania Power & Light, and Carolina Power & Light.
- Union leadership believes that current work and hiring rules in the bargaining unit contract may restrict the flexibility that JCP&L has to hire PSI graduates.
- The program requires a substantial commitment of time and money from the enrollees and will filter out those individuals who may not be fit for the rigorous requirements of the job.

4.2.6.3 Recommendations for Improvement

There are no recommendations for this section.

4.3 Providing Service Under Abnormal Conditions

4.3.1 Emergency Storm Restoration Plan

4.3.1.1 Background and Current Situation

FE has established a corporate-wide Emergency Storm Restoration Plan (ESRP). The ESRP was previously in place at the FE operating companies and was expanded to include JCP&L, MetEd, and Penelec after the merger. An electronic version of this plan may be accessed by all employees through Lotus Notes and over the Web-based intranet. The scope of the plan includes all operating companies, regions, and relevant corporate functions, including the Contact Center, Communications, and Energy Delivery Technical Services (EDTS). The ESRP's strategic objective is:

To anticipate, respond, and manage any type of electric interruption to our customers or system as quickly and as safely as possible, effectively using all available resources.

The structure of the ESRP mirrors that of the company in that responsibility for execution rests primarily in the 9 operating regions. The Manager of the Regional Dispatching Office ("Manager RDO") is responsible for monitoring weather and outage conditions and directing service restoration activities. Corporate EDTS is not directly involved in service restoration activities unless the storm reaches a severity whereupon the Manager RDO and Regional Director Operations Services believe that mutual assistance is necessary. EDTS is responsible for internal / external mutual assistance coordination, and the FE storm process.

Certain emergencies require the utilization of resources of all service support groups (i.e., those groups beyond the typical serviceman / line crew operation). The regional reporting structure for such

an emergency is depicted in Figure 59.

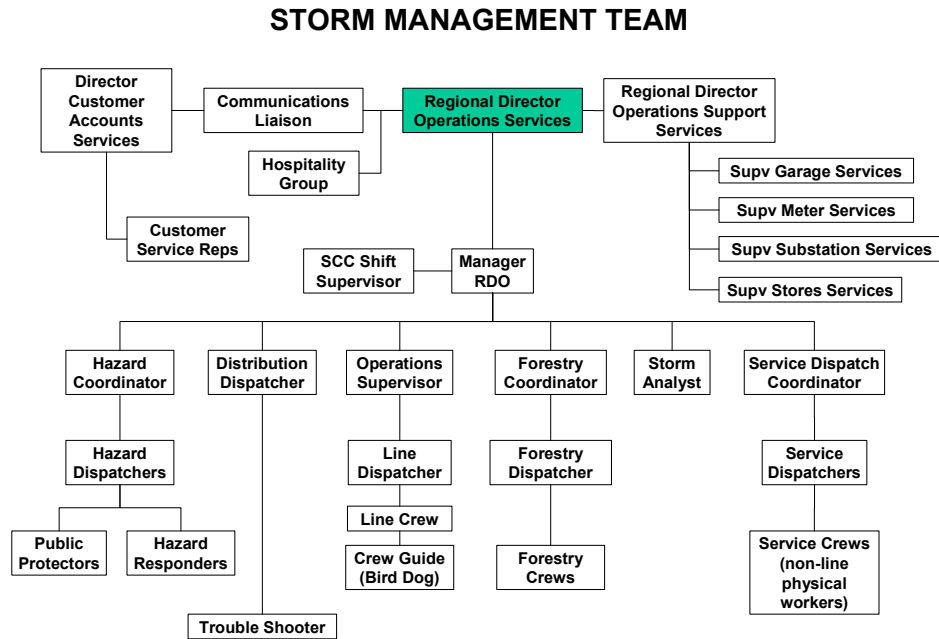


Figure 59
Storm Management Team

Responsibilities of the key members of the Storm Management Team are discussed in the “Management” section.

The ESRP itself consists of the six phases illustrated in Figure 60. These phases are described in the following sections.

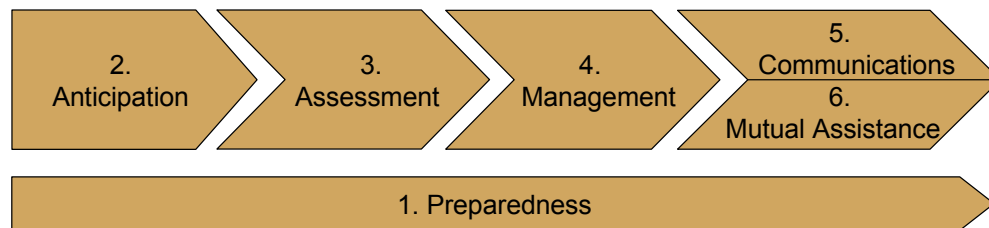


Figure 60
ESRP Phases

4.3.1.1.1 Preparedness

The strategic objective of the Preparedness phase is:

To ensure that all personnel having restoration responsibilities understand strategic objectives and are trained in detailed procedures using a plan that is continuously updated to reflect organizational changes and “lessons learned” from previous storms.

This phase of the plan includes activities that FE personnel perform throughout the year to help ensure that all areas of the company are ready to respond quickly and efficiently to outages. These activities include:

- Reviewing and updating the ESRP on an annual basis. The plan we reviewed was last updated on December 15, 2002. The NNJ and CNJ Regions participated in storm process workshops in the first quarter of 2003 to review the process as well as the functional responsibilities of the people involved in the process.
- Updating names and addresses of key personnel periodically, or as changes are made. During our review, we found contact information in the ESRP to be generally accurate and current.
- Conducting cross-functional critiques following Level II, III, and IV storms. Although it appears that such critiques do occur both formally and informally, notes from these critiques are not consistently maintained and distributed. Additionally, it does not appear that action items resulting from these critiques are consistently and systematically followed-up upon.
- Training employees on the plan through classroom sessions, simulations / drills, and on-the-job training. Storm-related training has been conducted for Hazard Responders (targeted to front-line hazard scouts, describing their responsibilities once deployed during an outage), hazard dispatchers, a storm workshop for regional leads in the storm process, service storm organization (use of meter and substation personnel to restore overhead services), Communication Liaison training, and PowerOn training. Storm drills were conducted in June 2003 for both CNJ and NNJ Regions.
- Coordinating JCP&L’s ESRP with other governmental agencies’ plans. The Customer Support Directors for NNJ and CNJ confirmed that either they or the appropriate Area Managers meet annually with the county and local Offices of Emergency Management (OEMs) to coordinate emergency plans.

4.3.1.1.2 Anticipation

The strategic objective of the Anticipation phase of the ESRP is:

To predict potential damage to the transmission and distribution system. Quick response to customer outages depends on advance warning. Monitoring weather conditions to predict potential system damage is essential.

As part of normal operations, the SCC and RDO constantly monitor weather patterns via the Weather Channel and other sources to anticipate storms that might affect service within the service territory. When severe weather is imminent, the Regional Dispatcher on duty initiates the process to notify the Storm Management Team.

The Storm Management Team will then use PowerOn and field reports to assign the appropriate storm severity, as indicated in Figure 61.

CATEGORY	ESTIMATED RESTORATION TIME	STAFFING REQUIREMENTS
Level I	Within 12 Hours	Requiring local resources only (crews normally assigned to that location)
Level IIa	Within 24 Hours	Requiring region wide resources Substantial hazards exist Hazard coordinator reports Hazard team is mobilized
Level IIb	Within 24 Hours	Substantial damage exists (If no area specified – REGION wide) Extended RDO staff to report (engineering and clerical support) Distributed Dispatching implemented Line, Forestry, and Substation Supervisors of area affected to report
Level IIc	Within 24 Hours	Major Damage All remaining Line and Substation Supervisors to report Communication liaison(s) to report All area managers to report Entire regional storm team activated
Level III	Exceeding 24 Hours	Requiring System-wide resources (Internal Mutual Assistance should be activated)
Level IV	Exceeding 24 Hours	Requiring resources external to the System

Figure 61
Storm Severity Levels

Storms are assigned a Level up to IIc by the regional management based on the expected level of staffing required to repair the outage. After the storm exceeds Level IIc, the necessary resources are

determined during a conference call involving the Regional Directors and the corporate staff. The assignment of Levels III and IV typically is performed during post-analysis for storm comparisons.

4.3.1.1.3 Assessment

The strategic objective of the Assessment phase of the ESRP is:

Every storm leaves a “footprint” of damages within our system. Our objective is to quickly and accurately assess damage within that “footprint” and restore our customers’ service in a timely and safe manner. Coincident with this objective is the early isolation of hazards from public contact.

The assessment of the storm’s impact or “footprint” is coordinated by the Regional Director of Operations Services (Regional Director of Operations Services), and is made using a combination of the following inputs:

- Outage Management System (“OMS” – FE’s OMS is PowerOn)
- Police and Fire Departments
- Remote Indicators (including circuit lockouts, alarms, and SCADA)
- Line Servicemen and Crews
- Damage Assessment Teams
- Aerial Patrols

FE’s goal is to have the Damage Assessment Teams prepare a detailed assessment of the storm within six hours. Once the assessment information is gathered, the Regional Director of Operations Services arranges a meeting with the Damage Assessment Team(s), which are typically comprised of select Hazard Responders, Operations Managers and Line Supervisors who are knowledgeable of construction standards and associated material requirements. During this meeting, the participants determine:

- Total amount of repair work required
- Number of crew hours required to make repairs (which can be estimated by the OMS)
- Equipment and material needs
- Appropriate storm category and need for mutual assistance
- Estimated restoration times, which are updated in OMS by the RDO

If the overall assessment indicates that service to all customers cannot be restored within 24 hours (i.e., Level III or IV storm), internal or external mutual assistance is activated. The Regional Director

of Operations Services will make the request to the Manager EDTS Operations Services, who will initiate mutual assistance.

4.3.1.1.4 Management

The strategic objective of the Management phase of the ESRP is:

To respond to and to manage all electric system disturbances, restoring service as quickly and as safely as possible, effectively using all available resources.

Under normal circumstances, routine trouble calls are analyzed by the Regional Dispatchers, who assign these cases to line servicemen / troubleshooters for restoration of service. Regional Dispatchers also coordinate transmission switching activities and the manning of distribution stations with the System Dispatcher.

Under storm / outage conditions, the Regional Director of Operations Services manages restoration efforts for the region. When the workload requires the Storm Management Team to be assembled, some dispatching activities may be reassigned. However, the RDO will continue to manage the OMS, and the Operations Manager(s) will monitor open Orders, assign crew work, and close completed Orders. In outage situations, priority is given to open Orders related to eliminating hazards, above those to restore service to transmission, substation, and distribution areas.

During a storm, communication from operating areas to the Storm Management Team is maintained through conference calls scheduled every 4 hours during an outage. The members of the Storm Management Team include:

- Regional Director of Operations Services
- Regional Director of Operations Support Services
- Manager Regional Dispatching
- Director Customer Account Services / Contact Center Supervisor
- Hazard Team Coordinator
- Operations Manager
- SCC Shift Supervisor
- Forestry Dispatching Coordinator
- Service Dispatch Coordinator
- Meter Services Supervisor
- Substation Services Supervisor

- Garage Services Supervisor
- Stores Services Supervisor
- T&D Engineering Services / Transmission Damage
- Communication Liaison
- Hospitality Coordinator

4.3.1.1.5 Communications

The strategic objective of the Communications phase of the ESRP is:

To establish mechanisms for communicating the status of the restoration effort to customers, governmental bodies, the news media, and company management.

This objective is achieved through comprehensive internal and external communications issued by JCP&L and FE to these interested constituencies.

4.3.1.1.5.1 Internal

The internal communication processes utilized during a major outage allow JCP&L to communicate the status of the outage and the subsequent restoration effort to company management and personnel. There are several processes in place to accomplish this internal communication including, but not limited to, requests for mutual assistance, restoration status updates to management, communication between the Storm Management Team and regional Communications staff, and correspondence between regional and corporate Communication groups. The internal communication processes are outlined in the ESRP and the FE Corp. Emergency Communications Plan. The individuals involved in the internal communications processes are the Regional Director of Operations Services, the EDTS Manager of Operations Services, and Communications Liaisons. Each of these individuals plays a role in communicating the events of the outage and the status of the restoration effort to company management and personnel. The Regional Director of Operations Services and the EDTS Manager of Operations Services are also responsible for initiating and coordinating mutual assistance. Within the internal communication landscape, the Communications Liaison acts as the information link between the regional dispatching office (RDO) and the various personnel charged with communicating the

outage information and restoration progress to company personnel. These company personnel include area managers, media pager duty personnel, customer service specialists, and regional and corporate communications. Figure 62 illustrates the communication channels through which information flows from the Communications Liaison.

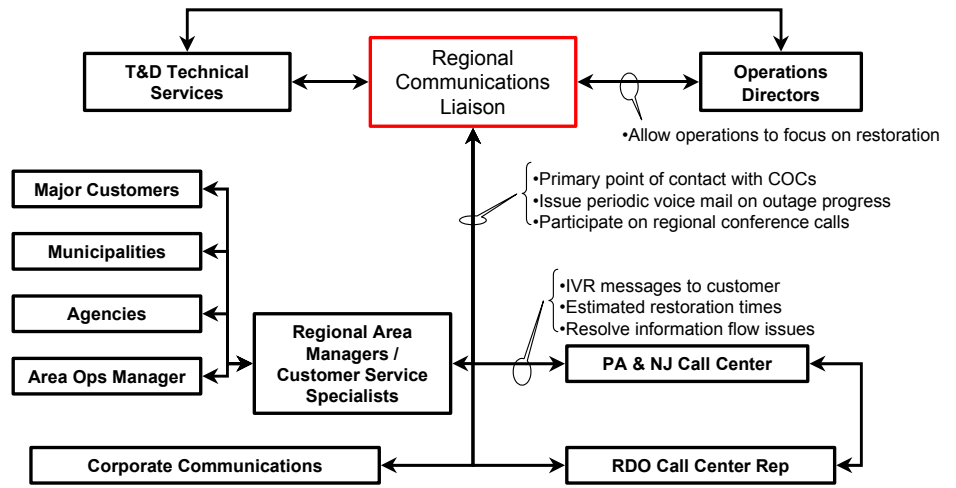


Figure 62

The Communications Liaison interfaces with many different constituencies during an outage situation and has many responsibilities. These responsibilities include:

- Provide periodic reports on restoration progress during extended emergencies;
- Act as a clearinghouse for the dissemination of information to the Contact Center, regional Communications, and regional Area Managers;
- Request assistance from Corporate Communications to provide restoration updates to appropriate constituents;
- Participate in regional Storm Management Team conference calls and corporate storm calls, acting as the point of contact for storm-related communications.

The Communications Liaison is responsible for gathering information related to the extent of the outage and the progression of the restoration effort. The outage information and restoration progress information is collected from PowerOn, EDTs, Regional Storm Management Team conference calls and emails, and Contact Center representatives. The Communications Liaison uses the information to complete hourly updates of the storm report summary and trends document for the affected region. These reports are posted to the regional page within the ESRP document. Once posted in the ESRP, regional and corporate personnel can reference the reports to obtain current outage-related information.

In addition, the Communications Liaison is responsible for communicating information regarding the extent of the outage and restoration progress to the Contact Center. The Communications Liaison is responsible for determining the need for special Interactive Voice Response (IVR) messages related to the outage and requesting the Call Center Analyst to establish the message in the IVR. If an IVR message is needed, the Communications Liaison will draft the content of the message based on the current restoration data. Within the ESRP, the Emergency Support Processes database contains pre-scripted IVR messages that the Communications Liaison can select and customize to the specifics of the outage. The IVR message is then electronically forwarded to the Contact Center Analyst. The Contact Center Analyst on duty receives the email message and is responsible for posting the message to the IVR. After the message has been recorded, the Analyst can electronically update the document to show the date/time when the change was made. This log of messages activated, message content, and messages deactivated can serve as a historical record for any member of the Storm Management Team to review. At the completion of the restoration phase of the outage, the Communications Liaison will request that the IVR message be deactivated. The Communications Liaison will also monitor the performance of noting Estimated Restoration Times (ERT) during outage projects. If there is a trend of ERTs not being realistically estimated, which adversely impacts customer service, the Storm Management Team and the respective outage organizations are advised so that the outage projection issue can be corrected.

The Communications Liaison is also responsible for disseminating outage and restoration information to the Corporate Communications organization. The Corporate Communications group has representatives stationed in Akron, OH; Reading, PA; and Morristown, NJ, to offer assistance to regional personnel when handling external communication. In large outage situations, it is common practice for the Storm Management Team to delegate the responsibility for all external media and regulatory communications to the regional Corporate Communications representatives. The restoration progress information is disseminated to internal constituencies via regional conference calls. These regional conference calls are scheduled every four (4) hours, or if a significant event or restoration occurs, to update the members of the Storm Management Team on the restoration phase of the outage. The Communications Liaison will gather the necessary restoration information from the conference call and will pass it along via voicemail or email message to the regional Communications representative, if this person is not already on the call. From this point, the regional Corporate Communications representative will coordinate external media and regulatory communications with other Corporate Communications representatives.

The Communications Liaison is responsible for communicating outage and restoration information to the regional Area Managers. The Area Managers act as the principal contacts between JCP&L and the state and county OEMs, state and local police and fire departments, municipal officials and representatives. The Communications Liaison will gather the outage and restoration information from the regional conference calls and will pass it along to the Area Managers via voicemail or email message. From this point, the regional Area Managers will coordinate external communications to all regional constituencies.

Finally, the Communications Liaison is responsible for providing a thorough briefing and recap of outage and restoration-related information to the Communications Liaison relief when changing shifts.

Conference calls between the Regional Dispatching Office (RDO) and regional and corporate management are another example of internal communications outlined in the ESRP. Every four to six hours, or if a significant event or restoration occurs, the RDO may contact management to update them on the restoration phase of the outage. Management personnel includes, but is not limited to, the Regional Presidents, the Director of Public Relations, the Regional Director of Operations Services, the Regional Director of Operations Support Services, Area Managers, the Manager of Transmission & Distribution Operations Services. In the later stages of the restoration phase of the outage, conference calls may be replaced by voicemail messages. The Storm Management Team conference calls are regionally focused while the Corporate Storm Calls are designed to give the corporate executive management team a regular update on the restoration progress in the affected region. These conference calls are summarized in Figure 63.

Type of Call	Call Frequency	Purpose of Call	Attendees
Regional Storm Management Team	Every four to six hours, or if a significant event or restoration occurs	Update the regional Storm Management Team and constituencies on extent of outage and restoration progress	<ul style="list-style-type: none"> • Regional Director Operations Services and Communications Liaison in affected region • Hazard, Forestry, Service coordinators • Line shop Managers • Regional Communications representative • Contact Center representative • EDTS Mgr Operations Services /Mutual Assistance (if needed) • Supply Chain/Logistics • Regional Dispatching Office Manager, Supervisor and Shift Lead • Regulatory Affairs and Security (if needed) • SCC Manager and/or Shift Supervisor (if needed) • Distribution IT Services
Corporate Storm Calls	Every four to six hours, or if a significant event or restoration occurs	Update corporate management team on extent of outage and restoration progress	<ul style="list-style-type: none"> • Regional Director Operations Services in affected region • Corporate Communications representatives • Contact Center (East and West) representatives • Senior Management and Energy Delivery Technical Support • Supply Chain/Logistics (if needed) • Regulatory Affairs and Corporate Security (if needed) • SCC Manager and/or Shift Supervisor (if needed) • Distribution IT Services (if needed)

Figure 63
Storm Management Calls

4.3.1.1.5.2 External

The external communication processes utilized during a major outage allows JCP&L to communicate the status of the outage and the subsequent restoration effort to customers, government and regulatory bodies, emergency management personnel and media. There are several processes in place to

accomplish this external communication including, but not limited to, proactive contact with state and local government and regulatory bodies, communication with OEMs, and proactive contact with media personnel. The external communication processes are outlined in the ESRP and the FE Corp. Emergency Communications Plan. The individuals involved in the external communications processes are the Regional and Corporate Communications representatives, the regional Area Managers, and the Media Pager Duty personnel. Each of these individuals plays a role in communicating the events of the outage and the status of the restoration effort to external constituencies.

In major outage events, it is common practice for the Regional and Corporate Communications personnel to assume responsibility for all external communication to government and regulatory agencies. The regulatory bodies within Ohio, Pennsylvania, and New Jersey have stated timetables for outage and restoration communications to which JCP&L and FE must adhere. The BPU requires all electric utilities in the State of New Jersey to report emergency and underground facility accident conditions within two hours of the incident. Regional communications representatives will communicate with the necessary regulatory agencies.

The Regional and Corporate Communications personnel, along with the Media Pager Duty personnel, may be charged with handling all media contact if responsibility is delegated to them by the Storm Management Team. In smaller outages, the Media Pager Duty personnel proactively contact local media to alert them of an outage situation, as well as conduct regular updates with radio and print media as requested. In larger outages, the Regional and Corporate Communications personnel handle all television, radio and print media correspondence as requested by external media groups. The Media Pager Duty personnel assume a supporting role to the Regional and Corporate Communications group as needed. Lastly, the Regional and Corporate Communications personnel will handle any non-outage related inquiries from external media.

Area Managers are responsible for communicating the outage information and restoration progression to the state and county Offices of Emergency Management (OEMs), state and county police, and municipal representatives, such as the mayor, local police and fire departments. In the case of large outages, JCP&L will send a representative to the OEM headquarters if the OEM requests an on-site representative to be present. This effort is coordinated through the Area Manager.

National account customer representatives will periodically communicate with major customers using OMS as an information source for restoration times.

Customers who report outages can request callbacks to confirm that their service has been restored. During smaller outages, contact center CSRs may personally call individual customers to make this confirmation. During larger outages, the IVR may be used instead. The Contact Center may provide estimated restoration times if available from PowerOn or from updates distributed within the Contact Center. The RDO may update restoration times in PowerOn to be made available to customers, or they may disable this feature during large-scale outages to allow the Contact Center to maintain control of restoration updates. Also, when the Communication Liaison provides an IVR update to the Contact Center, the Analyst on duty will distribute the latest information to CSRs to keep them apprised of the restoration status. Critical Care and Private Water Well customers will receive

notifications of outages expected to last longer than 24 hours through the 21st Century system; this is discussed in further detail in section 4.3.4 – Contact Center.

4.3.1.1.6 Mutual Assistance

The strategic objective of the Mutual Assistance phase of the ESRP is:

To respond to and manage all electric system disturbances, restoring service as quickly and as safely as possible, effectively using all available resources.

The mutual assistance process enables the region affected by the major outage to request additional resources to assist in the restoration effort. This process begins once the storm and the subsequent restoration effort have been assessed and categorized. The Storm Management Team assesses the extent of the outage and estimates the duration of the restoration effort. If it is determined that the restoration effort will be in excess of twenty-four (24) hours, mutual assistance is requested. The EDTS Manager Operations Services, along with the regional Operations Director in the affected region, coordinates the mutual assistance process. After the outage has reached a severity where mutual assistance is deemed necessary, the Regional Director of Operations Services will submit a request to the EDTS Manager Operations Services. The request may be verbally submitted during an outage assessment and restoration conference call or may be submitted via telephone or email message. The Manager of Transmission & Distribution Operations Services will identify the mutual assistance needs and will mobilize resources from other operating companies within FE to converge on the affected region. Crews from FE operating companies are used as the primary source of mutual assistance. If internal crews are unavailable for any reason, external crews from the Mid-Atlantic Mutual Assistance Group (MAMA) are requested. A secondary aspect of the mobilization effort is for personnel at the Information Technology (IT) Help Desk to be contacted to provide additional support in managing increased usage of the Outage Management System.

If the outage requires resources external to FE and has been categorized as Level IV, the Regional Director of Operations Services will submit a request for external mutual assistance to the EDTS Manager of Operations Services. The EDTS Manager of Operations Services will initiate a conference call of the members of the MAMA. The MAMA procedures state that the initiating utility will send an email message to all primary, secondary and alternate member utility contacts. Receipt of any response from the utility will be sufficient to consider that utility notified. The EDTS Manager of Operations Services will coordinate the mutual assistance efforts with the responding utilities as contact is made. In addition to external mutual assistance resources, contractors working for FE operating companies may be the quickest responding available resource. The ESRP contains lists of these contractors as well as those working for other external utilities, but MAMA must be initiated to request their assistance from their home utility.

4.3.1.2 Findings and Conclusions

- 1) The ESRP includes many processes that are industry leading practices and is adequate to achieve its stated objective.**
 - The plan is documented and available to all employees via the intranet.

- The plan and its components are regularly updated by appropriate personnel to reflect current information. The plan consists of a multi-phase approach and appropriate escalations.
 - Responsibilities of key personnel are clearly delineated and documented.
 - The plan incorporates a number of industry leading practices including restoration from the source to the customer, quick restoration of the maximum number of customers, and focusing resources based upon skill requirements.
 - The plan is well understood and applied across the organization - most interviewees were aware of its existence and contents, and were able to direct us to specific items in the plan.
- 2) **Some sections of the ESRP have not been updated to include JCP&L or the June 2003 SAP / PowerOn implementation, although these impacts would be minor.**
- The Mutual Assistance section contains system profiles for the Ohio operating companies, but not for JCP&L. These profiles contain an overview of the service territory, transmission, and distribution systems and may be helpful to foreign crews assisting in the restoration efforts.
- 3) **Storm critique sessions are conducted following major outages; however, notes and action items are not consistently maintained, distributed, or monitored.**
- We reviewed notes from corporate storm critiques that were conducted following storms in July, August, September, and December 2002. Each set of notes came from a different person in a different format. Project plans and status reports have not consistently been created to track the status of action items identified in the notes.
 - However, the Contact Center and Communications groups appear to consistently conduct storm critiques. The Contact Center provided the most consistent and thorough storm reports. The Director of Corporate Public Relations and Regional Public Relations Representative indicated that a media post mortem is utilized following outages as an opportunity to review company-issued press releases, and that all external communications (media releases, press conferences, radio / television interviews) are repeatedly reviewed and critiqued by all levels of the Communications organization.

4) Adequate internal communications processes and procedures are in place for use in abnormal operating situations such as major outages.

- The Director of Corporate Public Relations referenced the FE Corporate Emergency Communications Plan and the FE Emergency Storm Restoration Plan as the documents that outline the internal communication process.
- The process is regionally focused with the Communications Liaison acting as the primary point of contact for storm-related communications.
- The Communications Liaison collects and disseminates outage and restoration information to regional / corporate communications, contact centers, customer service specialists, area managers, and media pager duty personnel.
- Regional Storm Management Team and Corporate Storm calls are held every four to six hours to update regional and corporate management on the restoration phase of the outage.
- During outages in which it is determined that additional resources are needed to assist with the restoration effort, adequate processes for requesting mutual assistance are in place.
- These processes include the procedures for requesting mutual assistance from operating companies within FE and from operating companies external to FE.

5) Adequate external communication processes and procedures are in place for use in abnormal operating conditions such as major outages, including those for contacting government and regulatory bodies.

- The Director of Corporate Public Relations referenced the FE Corporate Emergency Communications Plan and the ESRP as the documents that outline the external communication process.
- The process is regionally focused with Corporate Communications personnel providing support in the event of major outages.
- Regional Communications and Media Pager duty personnel coordinate all media correspondence in an outage situation. In the case of major outages, the regional Storm Management Team may delegate all media responsibilities to the Corporate Communications group, with the regional Communications staff for support.
- Area Managers are responsible for communicating the outage and restoration information to the state and county OEMs, state and county police, and municipal representatives.
- Regional Communications personnel communicate with government and regulatory bodies when the Storm Management Team delegates responsibility to them.

- Due to the regularity of normal outages in an operating company region, regular communications with media, and regular external communications training, there is not a perceived need for regular drills of the external emergency processes and procedures.
- All Area Managers, Communications Liaisons, and regional leadership are trained annually in how to perform media relations.
- 6) Communications personnel are adequately trained and are able to exhibit skills in operating PowerOn (OMS) so that they have current knowledge of storm and restoration status.**
 - The Public Relations Representatives in New Jersey and Pennsylvania were with JCP&L prior to the FE merger and used PowerOn at GPU for several years.
 - These representatives have successfully used PowerOn through a number of outages over the past several years.
- 7) Work force levels are adequate for the Regional and Corporate communications organizations.**
 - The Public Relations Representatives stated that the Communications work force levels are adequate to respond in outage situations.
 - Other personnel indicated that the Communications group has been readily available and has responded quickly and timely in both normal and outage conditions; none indicated that the work force levels are inadequate.

4.3.1.3 Recommendations for Improvement

- 1) Update the ESRP to include JCP&L and the June 2003 SAP / PowerOn implementation. (Reference Conclusion No. 2)**

Description: Update the Mutual Assistance section of the ESRP to include a system profile for JCP&L. Update the entire ESRP based on the new SAP and PowerOn systems used at JCP&L.

Cost: Personnel will need to perform a review of the ESRP and update the necessary sections.

Benefit: The system profiles may be helpful to foreign crews assisting in restoration efforts. Updating the ESRP to include information on current systems will help reduce confusion when personnel reference the plan.

Priority: Low

- 2) Ensure that storm critique sessions are held following every Level II, III, and IV storm, and that appropriate records of such sessions, including lessons learned, are maintained. (Reference Conclusion No. 3)**

Description: Session participants should include all members of the storm management team, including line crew representation. Notes should contain lessons learned, and should be widely distributed and/or made available within the E-Plan. Action items should be assigned a responsible person and a due date, and progress toward completion should be tracked on a master schedule.

Cost: Critiques generally appear to be conducted regularly and require a few hours of each participant's time. The notes can be distributed using systems already in place. Monitoring of action items will require some project management effort.

Benefit: The company will benefit from the dissemination of lessons learned, helping to improve response to future outages.

Priority: High

4.3.2 Coordination with System Operations

Under abnormal conditions all activities performed throughout the electric system require interaction with the system operators for both the bulk transmission system and the distribution system. If significant portions of the system have been damaged or are isolated, then system operations will be required to coordinate and control the actions necessary to restore the system to stable operation. Safety of the public and utility personnel is the foremost concern. As the central clearing authority, the system operations function can ensure that as the system is re-energized, only those lines or facilities clear of hazards or ongoing work are made live.

4.3.2.1 Background and Current Situation

In JCP&L, the bulk transmission system is defined as all transmission lines, substations and associated equipment operating at a voltage greater than 34.5 kV. Prior to the merger of JCP&L with FE, the JCP&L transmission system control center (SCC) was located in Reading, Pennsylvania, and operated by GPU. Currently, the same Reading control center has responsibility for operating the bulk transmission system in the JCP&L service area. This center is responsible for controlling all of the bulk transmission of JCP&L, Penelec, and MetEd and the operation is integrated with the FE control center in Wadsworth, Ohio, which is responsible for controlling the bulk transmission for the remainder of the FE system.

FE, as a member of the PJM Interconnection, LLC (PJM), operates its bulk transmission system in accordance with the operating rules and standards prescribed by PJM and other regulatory and governing bodies. Many of the operating practices in the SCC are, therefore, governed by PJM and these practices flow through to and impact the operation of the JCP&L distribution system if the distribution facilities directly connect to the JCP&L bulk transmission system.

A number of areas of the operation of the SCC were considered that could impact the ability of JCP&L to restore service under abnormal operating conditions. The areas considered included the coordination of operations of the SCC with the JCP&L Regional Distribution Office (RDO),

emergency conditions preparedness, adequacy of staffing, training, and commonality and consistency of procedures for requesting and ordering line clearances and switching.

Under abnormal or storm conditions the SCC directs restoration of transmission lines and transmission substation component outages (including restoration of customers served directly from those facilities). The field personnel normally directed by this office are from the Substation Maintenance Section, Line Servicemen/Troubleshooters, and Line Crews.

Coordination between the SCC and RDOs is critical to safe and efficient operation of the electric system. Because the SCC operates under procedures specified by PJM, rather than FE, conflicts can arise between the SCC and RDOs. To mitigate these conflicts the SCC has pursued a number of initiatives to improve the coordination with the RDOs and promote a better understanding of the SCC by the RDOs.

These initiatives include:

- Developing a balanced scorecard to evaluate SCC performance and SCC impact on the RDOs;
- Conducting meetings between the SCC Director and the Regional Operations Directors and Operations Support Directors to improve the understanding of the interaction between the SCC and Regional Operations;
- Establishing a liaison relationship to determine how the SCC can better support the regions during storm conditions;
- Conducting on site visits at the RDOs by representatives of the SCC during emergencies to provide a “representative on the ground” and to better assess how the SCC can assist the regions under these conditions;
- Converting the outage notification from a paper based system to a phone call or pager based system to improve timeliness and the breadth of personnel receiving notification;
- Developing procedures of bulk transmission outages to coordinate multiple outages into single outages thereby reducing the total number of outages; and
- Identifying and correcting equipment operating under abnormal conditions, e.g. equipment that are reported as loaded to capacity but are actually below maximum loading.

4.3.2.2 Findings and Conclusions

1) Procedures are in place and are adequate for system restoration.

- The SCC has plans in place that address operations under emergency conditions and these plans are reviewed on a regular basis to ensure that they are current. The plans are coordinated with and approved by PJM. To evaluate the adequacy of these plans and to train operators two mock emergency exercises are conducted annually by PJM.

2) Adequate procedures are in place for requesting and approving line clearances.

- The SCC has written procedures for requesting and approving line clearances, which are consistent with the standards utilized by FE for approving switching and tagging at the distribution system level. The procedures are consistent across all FE regions except for specific instances where system condition or configuration dictates a variance.

3) Current staffing levels are adequate.

- The staffing of the SCC is currently adequate to meet its requirements. Most of the new hires to the staff are experienced system operators. This experienced hiring procedure reduces the amount of training that is required to maintain the skill level of the staff. Training that is conducted is presented by PJM and developed to PJM operating standards.

4) Operators can monitor system conditions in real time.

- The operating personnel continuously monitor system conditions in real time and the operations of the center and the procedures followed are common for both normal and abnormal conditions. No additional procedures are implemented in the event of emergency conditions that would require additional training or review.

5) Coordination with the RDO is satisfactory and initiatives are addressing improvements.

- The initiatives being pursued should reduce the conflicts between the RDOs and the SCC, reduce multiple scheduled outages of the same equipment, allow greater utilization of system assets, and improve overall availability of system assets.

6) PJM operations do not adversely affect JCP&L operations.

- The SCC stated that there had been a number of complaints from the regions and regulators that PJM operations had a negative effect on service delivery and availability in the regions. A review of reports prepared by the SCC substantiated that only a very small number of outages were forced by PJM and instead, the majority were attributable to the region's failure to meet the schedule set out in advance for switching operations.

4.3.2.3 Recommendations for Improvement

Our review of the SCC did not find areas that require additional actions to accommodate procedures or conditions that would have an adverse effect on JCP&L in the event of a major storm or outage.

4.3.3 Distribution Dispatch Operations

The Regional Dispatching Office (RDO) is responsible for controlling the sub-transmission and distribution systems. In JCP&L these systems are defined as all circuits and equipment with an operating voltage of 34.5 kV or lower. The RDO's responsibilities include monitoring the system load, issuing and approving switching orders and clearances, calling crews in to respond to outages, coordinating with the SCC for outages on the sub-transmission system that require interaction with the bulk transmission system, and other specific responsibilities under abnormal storm conditions described below.

Under abnormal or storm conditions the RDO directs restoration activities associated with the distribution systems. Servicemen/troubleshooters, assessment personnel, hazard responders and line crews operate under the direction of the RDO. The dispatcher directs crews from the line, substation maintenance and meter sections. If contractors or other utility company crews are used, the RDO will direct their restoration efforts through the use of company personnel assigned to these crews.

4.3.3.1 Background and Current Situation

Currently there is a single RDO for both the CNJ and NNJ Regions of JCP&L. This facility is located in Morristown, NJ. Plans are in place to separate this facility into individual RDOs for each region. Current plans anticipate the separation occurring after the summer peak period of 2003.

The Manager of Distribution Operations assumed his position in February of 2003. He has extensive experience in this area and has been employed by FE for over 33 years. His background includes experience in transmission and distribution maintenance, and dispatching and operations. He has been deeply involved in developing the operating procedures for FE that are currently being implemented at JCP&L.

The operating philosophy within all FE companies is:

- Personnel in the field need to be the doers.
- Personnel in the RDO need to be the managers.
- During storms, a Storm Analyst is assigned to the RDO to assist with the management of misinformation coming from inaccurate GIS data.
- The RDO has to participate in the planning of work.

4.3.3.1.1 Implementation of OMS Upgrade

On June 1, 2003, JCP&L went live with an upgrade of the PowerOn outage management system (OMS). This upgrade will enhance the outage prediction capabilities of the system allowing JCP&L

to better predict the number of customers out of service and to estimate more accurately the time required to restore customers.

Significant planning, problem anticipation, and data clean up went into the preparation for implementing the upgraded OMS. In the process of implementing the OMS system upgrade, a number of discoveries were made with respect to the physical configuration of the system and the OMS model of the system, e.g. inaccurate circuit configuration resulting from non-centralized switching operations. Because of these discoveries, it is anticipated that about 18 months will be required to conform the OMS model and physical system connections resulting in a fully integrated and fully functional OMS. The GIS audit is part of the ARIP scheduled for late 2004 completion.

The largest single problem is matching feeders to maps and records and achieving a 24-hour turnaround on the changes. Current estimates are that the underground system is 60-70% accurate and the overhead accuracy is 80-90% accurate. Initially it is anticipated that CAIDI may increase as the remainder of the system configuration errors are corrected. The quality of the data is continuing to improve.

There are some staffing shortfalls in the RDO. Currently there are 14 dispatcher positions that are to be filled with experienced personnel. This number of openings is partly driven by the plan to separate the current RDO into a facility in both NNJ and CNJ and the need to staff both locations.

4.3.3.2 Findings and Conclusions

1) The upgraded PowerOn should result in improved outage prediction.

- The PowerOn upgrade will allow changes to be immediately made in the network model, which will enable JCP&L to improve the OMS model.

2) Operations procedures reflect a proper emphasis on workforce skills and information requirements.

- To conform to the FE operating philosophy, JCP&L has implemented a new switching and tagging process that centralizes this function in the RDO. This procedure conforms to the procedure used throughout FE and will, because of the use of the same systems and procedures between all FE Regions, allow one region to manage other regions and off-load work when necessary.

3) Appropriate procedures are in place to ensure line clearances and tagging are conducted in accordance with published procedures.

- Line clearances and tagging are conducted in accordance with published procedures and approvals. One extra hand-off is included in the dispatching of some work types for JCP&L as the result of bargaining unit work rule – a dispatcher must pass the request to a clerk who then passes it on to a Troubleshooter. Under the best of circumstances this may cause longer than necessary restoration times.

- The implementation training for the new tagging and switching procedures were conducted at each district and RDO personnel participated in this training.
- 4) Training for dispatchers is being evaluated at this time.**
- Training for the RDO is conducted locally. The RDO is currently evaluating CD based training for dispatchers since there is no suitable dispatcher training program available.
- 5) RDO staffing is currently adequate and additional personnel will be required to staff two RDOs.**
- Staffing for the RDO is adequate, but the RDO Manager believes skill levels still need improvement. The skill level or accuracy of the RDO switching orders were mentioned by the bargaining unit as an indication that the centralized switching and tagging procedure contributes to confusion in performing work or restoration. It appears that the current skills of the RDO operators are contributing to this perception as opposed to the process itself being flawed.
- Staffing requirements for two RDO operations will have to be met before the RDO is separated for operations in each region.
- 6) Emergency action plans and storm procedures are adequate.**
- Emergency action plans for the RDO are in place and adequate. These plans will be exercised using mock storm scenarios to exercise communications and hazard responder groups. A meeting was scheduled for May 30, 2003, to discuss a mock storm to be held on June 15, 2003. Practice drills are also conducted with bulk transmission to simulate loss of all generation.
- Storm procedures are the same as day-to-day operations. No specific changes are incorporated during storms. The philosophy for storms procedures is "What you do today is what you do in a storm. You just do more of it." One key feature of the storm plan is that responders are not given more than one project because JCP&L wants to manage safety and efficiency. Efficiency is gained by enabling multiple organizations and processes to work in parallel. Every regional employee has a storm assignment. In mass, several hundred employees are involved in restoration rather than only a limited few. This limitation on responders is seen by the bargaining unit as an inefficient method; given the overall storm plan implemented by JCP&L, however, this limitation should not adversely affect the timeliness of restoration or the efficiency of responders.

4.3.3.3 Recommendations for Improvement

There are no recommendations for this section.

4.3.4 Contact Center

4.3.4.1 Background and Current Situation

The FE Contact Centers are listed in Figure 64.

Contact Center Group	Contact Center Locations	Operating Companies Served
East	Reading, PA (Primary) Allenhurst, NJ (Contingency)	JCP&L MetEd Penelec
West	Fairlawn, OH (Primary) Toledo, OH New Castle, PA	Ohio Edison Toledo Edison Cleveland Electric Penn Power

Figure 64
Contact Center Locations

During an outage in JCP&L service territory, the Reading Contact Center handles the majority of the customer calls, and the Allenhurst Contact Center is used as a contingency and overflow site.

4.3.4.1.1 Technology

The Contact Centers use IVR, 21st Century, and OSI to respond to customer calls during an outage:

- Interactive Voice Response (IVR):** The IVR is part of the Contact Centers' standard phone system that allows customers to report outages via an automated system; these outages are then transferred to PowerOn. In addition, the Contact Center posts outgoing messages on the IVR to provide customers with outage and restoration updates. The IVR is especially helpful to the Contact Center during the first couple of hours of an outage, as it quickly and efficiently handles a large number of calls without CSR intervention. The Reading IVR can handle approximately 520 simultaneous calls that last, on average, two to three minutes.
- 21st Century:** 21st Century, a third party contractor, provides an external IVR that also gives the customer an automated system to report outages. The Contact Center can use a software utility to reallocate calls at the phone company level to 21st Century's systems. Reported outages are then transferred back to JCP&L and fed into PowerOn. 21st Century is primarily initiated at the onset of a major outage when call volumes reach a level where they may exceed the phone system's capacity, and is typically only used for 1-2 hours at a time. 21st Century is also used to notify Critical Care and Private Well Water Customers during outages expected to last over 24 hours. 21st Century can handle approximately 2,000 simultaneous calls that last, on average, less than two minutes. Using 21st Century to facilitate a larger number of customers to report outages allows

JCP&L to quickly predict outage footprint and severity. This enables a quick assessment of the outage severity and results in better decisions for deploying crews.

- **OSI:** OSI, a third party contractor, performs non-matched callbacks during major outages. Non-matched calls result from customers who use an automated system to report an outage but do not call from the phone number associated with their account. Since the outage report cannot be matched to an account and transferred to PowerOn, these non-matched calls are held in a queue for a CSR to manually call the customer to verify their account and location of the outage. The Contact Center will outsource this function to OSI when call volumes are exceeding the capacity of the Contact Center CSRs.

The Contact Center Analyst on duty is responsible for monitoring call volumes and types, and for routing calls to 21st Century and OSI as necessary.

4.3.4.1.2 Workforce

Figure 65 presents the staffing levels at the Contact Centers as of March 2003.

Location	Management	Customer Service Representatives			Total Staffing
		Full-Time	Part-Time	Contractors	
East					
Reading	27	157	19	36	239
West					
Fairlawn	20	128	9	48	205
New Castle	1	15	1	0	17
Toledo	2	20	18	0	40
Total	50	320	47	84	501

Figure 65
Contact Center Staffing

This table does not include staffing counts for employees in Allenhurst. These employees primarily perform back-office functions and typically only answer calls during heavy volume and outage situations. In addition, OSI has up to 205 employees that can assist the Contact Centers.

Starting June 1, 2003, all FE companies are using the same SAP and PowerOn systems. However, the phone systems between the East and West Contact Centers are not integrated, however integration is planned to enable CSRs in the East to answer calls in the West and vice-versa. However, analysts based in any Contact Center will be able to provide assistance to any other Contact Center during outage situations, such as monitoring call volumes and types, and monitoring outage and restoration status.

4.3.4.2 Findings and Conclusions

- 1) **The Reading Contact Center has adequate staffing and technology to answer customer calls within regulatory requirements during an outage.**

- Upon reviewing twelve Contact Center Storm Summary reports for events during 2002 and 2003, all of the storm calls were answered within the mandated 45 seconds or less, except during July 2nd–July 4th, 2002, storm where customer calls averaged 62 seconds. According to the Manager Reading Contact Center during this storm, customers experienced heat related power outages due to blown fuses, transformers, and substation problems. Thus, the reasons for a higher Average Speed of Answer (ASA) during this outage included unstable and heavy call volumes, as well as an extended length of repeat calls by customers.
- According to the Director, Customer Contact Center, and the Manager, Reading Customer Contact Center, the number of CSRs is generally sufficient to handle all calls in normal and outage situation.
- During the event of an unanticipated storm the "On Call" Team will be called first when in need of supplemental staff due to augmented call volumes. Employees are expected to be on the property within 30 minutes of the page. If the 30 minutes should pose a problem, the employee is responsible for notifying the on call supervisor.
- In the event of an anticipated potential outage, Contact Center Leadership will pre-plan all staffing requirements. Blocks of time will be distributed and employees will sign up for a period of time. Prior to the employee reporting to work for their allotted time, they will call and listen to a recording to find out if they should report to work on their designated time.
- If a surplus of staffing is required, the master call-out list will be initiated. The Contact Center Manager will determine if a mandatory call out requirement is needed.
- According to the Contact Center Director and Manager, the Contact Center experiences a high call-out success rate during storms. Per the Director, Customer Contact Center, the Reading Contact Center experiences enough events during the course of the year that call-out drills are unnecessary.
- At the beginning of a storm, the Contact Center is dependent upon its IVR to handle the initial load of customer calls. As CSRs report to work, customer calls can then be shifted to the CSRs. This use of technology is consistent with the typical trend during a storm, as customers prefer to get their information from a live agent rather than an IVR as the storm lingers.

2) Storm support outage procedures for New Jersey are adequate and followed appropriately.

- New Jersey Storm support outage procedure document details the actions that are taken by the Reading and Allenhurst Contact Centers during different scenarios of an outage.
- The procedures capture the people involved during an outage, their roles and responsibilities, and the technology used.
- The procedures documented are posted within the E-Plan, an internal emergency Lotus Notes database accessible to parties involved during the storm.
- The Contact Center Storm Summary reports and interviews with Contact Center management revealed that storm support outage procedures are generally followed appropriately.

3) The Reading Contact Center appropriately participates in drills to help ensure its ability to respond during an outage.

- According to the Manager, Reading Contact Center, the area participates in regional storm drills conducted semi-annually. The Reading Contact Center also conducts fire drills annually where they evacuate the Contact Center, post messages for customers calling in and reroute the calls to the Allenhurst Contact Center.

4) The Reading Contact Center is appropriately involved in continuing communication with customers during an outage to update them on the storm status.

- During an outage, communication from operating areas to the Storm Management Team is maintained through conference calls scheduled every four hours. Manager, Reading Contact Center, who is part of the Storm Management team attends these conference calls as the Contact Center representative. Information from this conference call assists the Manager, Reading Contact Center to recognize the CSR requirements during the storm. The conference calls also provide restoration times, which are used by the Manager of Contact Center to convey to its CSRs. These restoration times are further conveyed by the CSRs to the customers.
- The Communication Liaison, who is also part of the Storm Management Team and participates in the scheduled conference calls, is responsible for updating IVR messages for the Contact Center. The Communication Liaison composes restoration time information into IVR messages and feeds them to the Contact Center analyst to post them on the IVR every four to six hours or when the situation changes.
- During a storm Critical Care and Private Well Water Customers are informed by the Contact Center if they will be in an outage situation for more than 24 hours using 21st Century.

5) Communication protocols to mobilize internal and third party resources during a storm are adequate.

- Adequate communications protocols are in place to mobilize CSRs during the event of a storm.
- During a storm outsourcing company OSI is contacted to request work on non-matched calls.
- 21st Century is an automated function that can be made operational during periods of heavy call volume, and also when the Critical Care and Private Well Customers need to be contacted if the outage in their area will last more than 24 hours.

6) The Critical Care Customer identification and notification process has been properly implemented.

- According to the Manager, Business Services, all JCP&L residential customers were sent Critical Care Customer bill inserts during the months of April and May as mandated. In the future the utility will continue to send bill inserts semi-annually to confirm status of the customers on the program.
- As customers signed up for the program their names were input into Microsoft Access database that contains the Critical Care Customer list. According to the Directors, Customer Support in the CNJ and NNJ Regions, the county and municipal Offices of Emergency Management (OEM) are provided an updated list of Critical Care Customers semi-annually via fax, e-mail, or in person.
- According to the Manager, Reading Contact Center and Directors, Customer Support in CNJ and NNJ Regions, 21st Century is used to send IVR messages to all Critical Care Customers if their power is expected to be out for more than 24 hours. When the Storm Management Team determines that an outage will last more than 24 hours, the Contact Center Manager will query the Critical Care Customer database to retrieve a list of the affected customers and their phone numbers. This list is then uploaded into the 21st Century system, which will make two attempts to contact the customer to notify them of the outage. The Contact Center has pre-recorded IVR messages for these notifications that can be used, but can also record a custom message if necessary. Reports are available within the 21st Century system to monitor the success of the notification process.
- According to the Directors, Customer Support in the CNJ and NNJ Regions, the Critical Care Customer list is available on the LAN and in E-Plan and the key personnel in the department has access to it. The Directors are comfortable that the Critical Care Customer list can be made available for the OEMs within the hour when requested, as mandated.

- Further, per the Directors, Customer Support in the CNJ and NNJ Regions, every county has a JCP&L liaison assigned to them who periodically interfaces with the county director and provides them with the updated Critical Care Customer list.
- 7) **The Private Well Water Customer identification and notification process has been properly implemented.**
 - According to the Manager, Business Services, all JCP&L residential customers were sent Private Well Water bill inserts during the months of April and May as mandated. In the future the utility will continue to send bill inserts annually to further identify those customers who depend on a private well for drinking water.
 - As customer signed up for the program, their names were input into Microsoft Access database that contains the Private Well Water Customer list.
 - According to the Directors, Customer Support in NNJ and CNJ Regions the list of Private Well Water Customers is provided to the county and municipal OEM offices within the JCP&L service area, annually. In the future also the OEM's will receive the updated Private Well Water Customer list annually.
 - According to the Manager, Reading Contact Center and Directors, Customer Support for NNJ and CNJ Regions, 21st Century is used to send IVR messages to all Private Well Water Customers if their power is expected to be out for more than 24 hours. When the Storm Management Team determines that an outage will last more than 24 hours, the Contact Center Manager will query the Private Well Water Customer database to retrieve a list of the affected customers and their phone numbers. This list is then uploaded into the 21st Century system, which will make two attempts to contact the customer to notify them of the outage. The Contact Center has pre-recorded IVR messages for these notifications that can be used, but can also record a custom message if necessary. Reports are available within the 21st Century system to monitor the success of the notification process.

4.3.4.3 Recommendations for Improvement

There are no recommendations for this section.

4.3.5 Storm Restoration Work Force Requirements

4.3.5.1 Background and Current Situation

The scope of the review of storm restoration workforce requirements focuses on line crew requirements under abnormal conditions. Crews are the key component to the restoration of service under abnormal conditions once a damage assessment is completed.

FE uses the following to assess a storm's impact:

- PowerOn (OMS)
- Police and Fire personnel
- Remote Indicators (including circuit lockouts, alarms, and SCADA)
- Line Servicemen
- Line Crews
- Damage Assessment Teams
- Aerial Patrols

FE's hazard response philosophy dictates that hazardous situations, such as damaged equipment and downed power lines, must be located, identified, secured from public contact and reported to hazard dispatching. Consequently, the hazard response process may be assigned a higher priority than the preliminary assessment process. Based on the duties that must be performed by the hazard responder, it is common practice for more experienced non-line technician outage restoration personnel to be assigned to the hazard response effort and have less experienced personnel assist standing by hazardous situations as a public protector.

FE practices a "cut and run" procedure that eliminates hazards and restores customers upstream in a short period of time (usually less than 20 minutes work). Line crews will complete repairs and restore customers downstream once all hazards and situations are corrected where upstream customers can be restored are completed.

4.3.5.1.1 Regional Variations

The storm-related issues faced by JCP&L in the NNJ Region vary from those faced by the CNJ Region. In the NNJ Region, the main issues in a storm are related to downed tree limbs and branches and other vegetation control situations. The service territory in NNJ is densely wooded, even in areas close to cities and towns.

The CNJ Region's main issues in a storm are related to the intense heat and humidity, as well as high winds that are characteristic of the peak summer season. As a result of these extreme weather conditions, severe rain, lightening and thunderstorms are prevalent and can commence with little or no warning.

Although these regional variations exist, the emergency workforce requirements issues are similar.

4.3.5.1.2 Emergency Workload

The Regional Director of Operations (or designated representative) will determine the need to assemble and assign Damage Assessment Teams to affected areas or circuits in a storm-related outage situation. FE's goal is to have the Damage Assessment Teams produce a detailed assessment of the storm within six hours.

Once the assessment information is gathered, the Regional Director of Operations calls a meeting of the Damage Assessment Team, which is typically comprised of select Hazard Responders, Operations Managers and Line Supervisors who are knowledgeable of construction standards and associated material requirements. The Team determines the:

- Total amount of repair work required
- Number of crew hours required to make repairs (which can be estimated by the OMS)
- Equipment and material needs
- Appropriate storm category and need for mutual assistance
- Estimated restoration times, which are updated in OMS by the Regional Dispatch Office.

If the overall assessment indicates that service to all customers cannot be restored within 24 hours (i.e., Level III or IV storm) with the region's resources, internal or external mutual assistance is activated. The Regional Director of Operations makes the request to the Manager T&D Operations, who will in turn initiate mutual assistance.

The EDTS Manager Operations Services will mobilize resources from other FE Regions based on the assessed need. If the need exceeds the response capability of internal crews, external crews from the Mid-Atlantic Mutual Assistance Group (MAMA) are also requested. (See "Mutual Assistance" in Section 4.3.1.1 for additional information.).

In addition to external mutual assistance resources, contractors working for FE operating companies may be the quickest responding available resource. The ESRP contains a list of regional contractors as well as those working for other (non-FE) utilities. MAMA must be initiated to request assistance from the utility whose contractor may be needed.

4.3.5.2 Findings and Conclusions

1) The current call out response rate for the CNJ and NNJ Regions, although not optimal, is improving.

- The GPU call out response rate and the 2002 rate was approximately 20%.
- Management's current expectation is 100% response to call outs and response rates do not currently reach that level (NNJ 70+%).
- If the mutual assistance partners mirrored a call out response rate of 20%, any mutual assistance agreement would be relatively useless in widespread Level III or IV storm.

2) The damage assessment process used is a reasonable and systematic approach that allocates resources appropriately.

- Damage assessment is expected to be completed within 6 hours.

- Damage Assessment is not performed solely by line crews but rather by a variety of utility personnel, allowing line crews to concentrate their experience on the initial restoration work (cut and run).
- Training is provided on hazard response and damage assessment.

3) Mutual assistance process is good and meets the needs of the CNJ and NNJ Regions.

- Once the damage assessment determines the requirements are beyond the capabilities of the region, the EDTS Manager Operations Services has a number of sources from which to draw any additional crews.
- Mutual assistance criteria stipulate that crews on loan should be given the consideration of full eight-hour rest periods in a 24-hour period. This is taken into account when determining the proper number of mutual assistance crews to mobilize for a given damage assessment.

4) The regional crews, in concert with the available mutual assistance support, are sufficient to respond to Level III and Level IV storms.

- Crew call out response has improved, leading to greater crew availability for storm response.
- Early damage assessment enables accurate definition of the workforce requirements for a particular event.
- Mutual assistance can be requested from a variety of sources including some that are potentially outside all but the largest storms that may hit New Jersey. These include FE Regions in Ohio, Western Pennsylvania and other MAMA members outside the immediate New Jersey/Eastern Pennsylvania area.

4.3.5.3 Recommendations for Improvement

There are no recommendations for this section.

4.3.6 Training

4.3.6.1 Background and Current Situation

Training on the FE Emergency Storm Restoration Plan (ESRP) varies from group to group within the FE Energy Delivery organization. The variations in training are dependent upon the assigned roles each group plays in the ESRP. For example, Regional Engineering, Metering, Substations, and Meter Reading groups are trained in the areas of Hazard Response, Hazard Dispatch, Service Restoration and PowerOn Remote Access. Individuals within each group can be cross-trained in several aspects of the ESRP.

However, training of the district line crew personnel on the ESRP is more informal. The training includes special meetings and routine briefings conducted by the Operations Managers in conjunction with the line supervisors for each district. These training sessions concentrate on two aspects of the ESRP process:

- The RDO dispatching line crews to act as trouble crews early in the restoration process of the outage; and
- The “cut and run” practice used to eliminate hazards, isolate an affected area and restore customers upstream in a short period of time (usually less than 20 minutes of work).

In some JCP&L districts, both of these practices were significant changes to the pre-merger restoration process. The “cut and run” methodology calls for crews to isolate an affected area and restore as many customers as possible, and quantify the remaining work. Remaining repairs are then sent to the Forestry, Line or Service storm organizations. This differs from the former restoration process that called for crews to complete restoration at a single location before moving to the next location. The “cut and run” process was difficult for line crews to accept as crews believed they were more effective completing the restoration of all problems at a location in one visit. One on one discussions with line personnel and coaching were used to provide a perspective of the “cut and run” practice in the context of the overall process to bridge the acceptance gap.

Other than these two practices, all other aspects of the lineman’s job under storm recovery conditions were unchanged. No other training was determined to be necessary for line personnel.

4.3.6.2 Findings and Conclusions

1) Training on the ESRP is generally adequate but there is room for improvement.

- Personnel, when questioned about their assigned roles during emergencies, were knowledgeable about the requirements.
- Although all personnel seemed to understand the “what” and the “how” of their role during an emergency, there is confusion at the line level as to the “why” of the “cut and run” practice.
- *Single-Phase Service Restoration During Emergencies* training was administered to the NNJ Meter and Substations organizations during seven, 3-day sessions between 6/11/02 and 7/25/02. The training was administered to the CNJ Meter group during a 1-day session on 8/14/02.
- *Secondary Service Restoration Process* training was administered to the CNJ Substations organization during a 1-day session on 5/31/02. It is not clear that this training was administered in NNJ.

- *Hazard Responder* training was administered to NNJ Meter personnel in two, 1-day sessions held on 4/30/02 and 5/1/02. It is not clear that this training was administered in CNJ.
- *Hazard Responder Refresher* training was administered to some Operations personnel in the NNJ districts and the CNJ districts.
- There is no formal training of line crew personnel in the ESRP beyond meetings conducted by Operations Managers.
- There is no formal refresher training of line crew personnel in the ESRP.

4.3.6.3 Recommendations for Improvement

1) Improve training of District line crew personnel on the ESRP and their role in the plan. (Reference Conclusion No. 1)

Description: Develop and deliver training for the line crew personnel regarding the ESRP and their roles during an outage.

Cost: This recommendation has costs associated with development and attendance of training courses focused on the roles played by the District line crew personnel in the ESRP.

Benefit: Acceptance and execution of the line crew's role in the ESRP would be enhanced as a result of better training in the overall process.

Priority: High

2) Provide District personnel with refresher training on the overall ESRP. (Reference Conclusion No. 1)

Description: Develop and deliver refresher training for district personnel regarding the overall ESRP.

Cost: This recommendation has costs associated with development and attendance of refresher training courses focused on the roles played by the District line crew personnel in the ESRP.

Benefit: Periodic refresher training would improve the execution of the FE ESRP, thus increasing the efficiency of the restoration phase of the outage.

Priority: High

3) Add Web-Based training for the ESRP. (Reference Conclusion No. 1)

Description: Make ESRP training available via the intranet so that employees can review the content during inclement weather.

Cost: The costs associated with this recommendation would be those to deploy the training materials for access on the FE Intranet.

Benefit: Web-based training carries the potential savings associated with reduced training personnel, while allowing general personnel to access materials from their workstations. Once these training materials are accessible via the FE Intranet, the refresher training courses previously discussed could be eliminated.

Priority: Low

4.4 Service Complaints

4.4.1 Background and Current Situation

As stated previously, FE approaches reliability from a customer perspective. Research performed by FE has determined that customers evaluate a utility based on two aspects: duration of sustained outages and the frequency of momentary interruptions. These two areas form the basis for the majority of service complaints.

The BPU monitors four categories of customer complaints for the different utilities operating in the state though there do not appear to be standards of performance or expectations specified for these complaints.

The four categories are:

- Service
- General Billing Inquiries
- High-Bill Complaints
- Collections

Figures 66 and 67 illustrate the number of service complaints, and number of service complaints per customer for the New Jersey utilities.

	1997	1998	1999	2000	2001	2002	Total
Connectiv	87	77	105	34	28	51	383
JCP&L	184	157	636	395	280	350	2,002
PSE&G	260	431	538	333	359	431	2,352
Rockland	16	3	11	0	7	9	46

Figure 66
Number of Service Complaints for New Jersey Utilities

	1997	1998	1999	2000	2001	2002	Average
Connectiv	5,462	6,165	4,637	14,355	17,555	10,074	7,667
JCP&L	5,228	6,220	1,553	2,545	3,651	2,954	2,991
PSE&G	7,272	4,420	3,556	5,964	6,008	5,401	5,178
Rockland	4,176	22,599	6,203	-	9,870	7,823	8,935

Figure 67
Number of Customers per Service Complaint for New Jersey Utilities

Solely from these statistics it appears that JCP&L has a greater incident of customer complaints related to service. However, the data analyzed does not account for differences in service areas that might influence the number of complaints, nor is the data specific as to what constitutes a “service” complaint.

FE participated in the 2002 Electric Utility Residential Customer Satisfaction Survey conducted by J.D. Power and Associates. Customers that participated in the survey rated the utilities on the following five factors as they contribute to customer satisfaction:

- Power quality and reliability
- Company image
- Price and value

- Billing and payment
- Customer service

FE scored above the industry average in the Overall Customer Satisfaction Index, which is a combination of all five factors above. In the areas of Power Quality and Reliability, and Customer Service, FE also scored above average.

4.4.2 Findings and Conclusions

- 1) **On average, JCP&L has had the worst service complaint metrics of the utilities in New Jersey, but ongoing initiatives to improve reliability through CRI, and the ARIP should reduce customer complaints.**
 - From 1997 through 2002, JCP&L has had 2,002 service complaints, second only to PSE&G with 2,352.
 - From 1997 through 2002, JCP&L has had the worst average number of customers per service complaint metric of all utilities in New Jersey.
- 2) **Measures taken by JCP&L, designed to improve reliability, should help to reduce the number of customer complaints.**
 - CRI, used to measure circuit performance and customer reliability, is a customer-focused measure.
 - The implementation of the ARIP will likely increase reliability and level of service to customers.
 - The accelerated completion time improves customer satisfaction.
 - The adoption of the FE Area Manager position by JCP&L provides districts a point of contact and illustrates the increased local focus.

4.4.3 Recommendations for Improvement

No recommendations are included here to address service complaints. The recommendations found elsewhere in this report related to reliability improvements, productivity, and storm restoration address this issue.

5 APPENDIX A – CIRCUIT RELIABILITY INDEX (CRI) DEVELOPMENT

The following information on the development of CRI was provided by FE.

FE uses CRI as a measure of circuit performance. The Circuit Reliability Index (CRI) was derived by Ohio Edison from the Circuit Performance Index (CPI) developed by Houston Lighting and Power Company (HL&P). This index is a fusion of four reliability measurements (SAIFI, CAIDI, MAIFI and Lockouts) into one overall indicator.

$$\text{SAIFI (System Average Interruption Frequency Index)} = \frac{\text{Customers_Interruptions}}{\text{Customers_Served}}$$

Typically SAIFI (a unit-less number) varies between 0 to 10 and has an average value that ranges from 0.5 to 2

$$\text{CAIDI (Customer Average Interruption Duration Index)} = \frac{\text{Customer_Minutes}}{\text{Customers_Interruptions}}$$

Typically CAIDI (measured in minutes) varies between 0 to 800 and has an average value that ranges between 50 to 200 minutes

Momentary outages for FE are defined those that have duration of less than one minute or the normal relay operating sequence of a circuit relay. Typically MAIFI (a unit-less number) varies between 0 to 50 and has an average value that ranges from 2 to 5

Lockouts (LO) = The number of times a circuit breaker locks open

Typically a lockout (a unit-less number) varies between 0 to 5 and has an average value that ranges from 0 to 2

To account for variation in these four measurements the following adjustment factors were developed by HL&P to normalize the circuits to a common basis. These factors are calculated on a base year of reliability data excluding major storms.

- Range Factors (RF) - accounts for a wide or narrow range of values
- Weighting Factors (WF) - assigned to reflect customers' perception of the impact of reliability
- Equalization Factors (EF) - equalizes the relative magnitudes
- Index Factor (IF) - adjusts average to equal 100

The FE factors were originally calculated for Ohio Edison in 1994. Factors are periodically reviewed to ensure the measurement reflects customer expectations. The factors are presented in Figure 68.

	<u>MAIFI</u>	<u>CAIDI</u>	<u>SAIFI</u>	<u>Lockouts</u>
IF = 1.06	RF1 = 1.099	RF2 = 1.697	RF3 = 1.393	RF4 = 0.561
	WF1 = 0.300	WF2 = 0.250	WF3 = 0.250	WF4 = 0.200
	EF1 = 14.705	EF2 = 1.000	EF3 = 65.852	EF4 = 222.735

Figure 68
CRI Factors

With the inclusion of these factors, the CRI is shown below:

$$CRI = IF * \{(MAIFI*RF1*WF1*EF1) + (CAIDI*RF2*WF2*EF2) + (SAIFI*RF3*WF3*EF3) + (LO*RF4*WF4*EF4)\}$$

Multiplying the IF x RF x WF x EF for each of these indices yields the following multipliers:

$$CRI = (5.14*MAIFI) + (.45*CAIDI) + (24.3*SAIFI) + (26.5*Lockouts)$$

To establish a basis of an acceptable CRI value, customer expectations of outage duration, frequency and number momentary interruptions were determined through statistically valid customer surveys performed in 1995. Customers typically considered acceptable reliability to be 2.4 sustained outages lasting 120 minutes and 3.8 momentary operations per year. These customer expectations result in an acceptable CRI value of 130. The FE ultimate goal is that 80% of the circuits should have a CRI less than 130. This recognizes the fact that it is not economical to design, build and maintain a distribution system that will never experience an outage. Some FE Regions may have less than 80% of their circuits meeting this goal, however goals are set to encourage improvement.

To monitor circuit performance, reports are generated monthly showing 12-month rolling average and year-to-date CRI values for every distribution circuit. EDTS produces a monthly CRI report showing the number of circuits that exceed the 130 value and percentage of circuits at or below the 130 value. The regions use these reports to assess their performance compared to their regional CRI goals.

Regional CRI Teams meet regularly to review poor performing circuits. If the CRI of a circuit increases significantly, it is reviewed to determine the cause(s) of the customer outage(s). Typically the actions taken include:

- Trim trees
- Install additional protective devices
- Field review the circuit for unusual conditions
- Develop a capital project to improve the circuit reliability
- Do nothing (particularly if the high CRI is due to only one or two outages)

This review of circuits allows the region to provide improvements, which directly affect the customer. The typical reliability improvement results include:

- Reduced circuit lockouts – less customer affected during an outage
- Reduced momentary interruptions
- Improved CAIDI

The FE CRI program has been proven to be very successful in improving overall circuit reliability.

6 **APPENDIX B – DEFINITIONS**

The following definitions are applicable to this report. Some of the definitions contained herein are defined in accordance with specific JCP&L or New Jersey standards.

Term	Definition
Arrester	Device that protects equipment by channeling lightning current away from the protected equipment directly to ground.
CAIDI	Customer Average Interruption Duration Index [IEEE Standard Definition for Reliability Statistics] $CAIDI = \frac{\text{Sum of All Customer Interruption Durations}}{\text{Total Number of Customer Interruptions}}$
Circuit Miles	Includes the total lengths for all distribution spans in miles of separate circuits (pole to pole). Underground circuits are also included.
CREWS	Customer Request Work Scheduling System provides the functionality for: Estimating job costs, Estimating man-hours, Producing Material Reservations, Scheduling job tasks, Routing job tasks, Managing job tasks, Billing, Joint Use, Time Entry, Construction/work completion, and Reporting on jobs.
CRI	Circuit Reliability Index is a key reliability measure within FE and JCP&L. CRI is a method to measure how well FE is providing reliable service relative to customer expectations in terms of outage frequency (momentary and sustained) and outage duration by circuit.
Crossarm	At the top of a utility pole, a wooden bar to which power lines are attached. The cross arm keeps the lines separated by a sufficient distance to prevent arcing.
Compatible Unit	Compatible Unit (CU) is a standardized assembly that represents the labor tasks, vehicle/equipment hours, and materials required for a construction, maintenance, or operations activity. It may also include facility attributes, accounting information, and unit of property information.
Cutout	A term commonly used by operators to describe a distribution system fuse.
Fuse	A device consisting of conducting material which melts and burns open when a specified current value is exceeded.
Interruption	Loss of service for more than five minutes to one or more customers
Lockout	A circuit breaker locks open
MAIFI	Momentary Average Interruption Frequency Index [IEEE Standard Definition for Reliability Statistics] $MAIFI = \frac{\text{Total Number of Customer Momentary Interruptions}}{\text{Total Number of Customers Served}}$
MAMA	Mid-Atlantic Mutual Assistance group consists of regional of EEI Mutual Assistance member utilities that provide assistance to other members in restoring service as quickly and safely as possible.
Momentary	An electrical outage lasting one minute or less (FE definition). (see also “Sustained”)
PJM	Pennsylvania-Jersey-Maryland Interconnection, a group of electric utilities who jointly plan and operate the bulk power supply system for the three-state region.
Pole (or Line) Miles	Includes the length along the span of poles, structures, or towers carrying conductors, regardless of the number of conductors or circuits carried (pole to pole.) Underground lengths are also included. Pole miles provide a better criterion for benchmarking line employees than do circuit miles.
Recloser	Actually, line recloser; an automatic device that senses and interrupts distribution system faults. The recloser will automatically test and restore power to the circuit on temporary faults. With persistent faults, the recloser will remain in the open position and prevent it from making any more automatic tests of the circuit.

Term	Definition
SAIDI	System Average Interruption Duration Index [IEEE Standard Definition for Reliability Statistics] $\text{SAIDI} = \frac{\text{Sum of All Customer Interruption Durations}}{\text{Total Number of Customer Served}}$
SAIFI	System Average Interruption Frequency Index [IEEE Standard Definition for Reliability Statistics] $\text{SAIFI} = \frac{\text{Total Number of Customers Interrupted}}{\text{Total Number of Customers Served}}$
SCADA	System (or Supervisory) Control and Data Acquisition is a common process control application that collects data from sensors in remote locations and sends them to a central computer for management and control.
Surge	A short duration overvoltage or overcurrent
Sustained	An electrical outage that lasts longer than one minute (FE definition). (see also "Momentary")